United States Department of Agriculture

Forest Service

March 2012

Wells Branch Timber Sale Environmental Assessment

USDA Forest Service
Clinch Ranger District

George Washington and Jefferson National Forests

Lee and Wise Counties, VA

For Information Contact:

Clinch Ranger District
Project Coordinator
George Washington
& Jefferson National Forests
9416 Coeburn Mountain Road
Wise, VA 24293
Phone: 276-328-2931

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1.1 Introduction

The Forest Service proposes to treat vegetation on National Forest lands in compartments 2088, 2089, 2090, and 2094 on the Clinch Ranger District of the Jefferson National Forest. This area is located approximately 1.5 miles south of Exeter, VA off State Route (SR) 623 in Lee County. The project area lies in the Laurel Fork Drainage of Pigeon Creek and the Wells Branch drainage of the North Fork Powell River (see project area map).

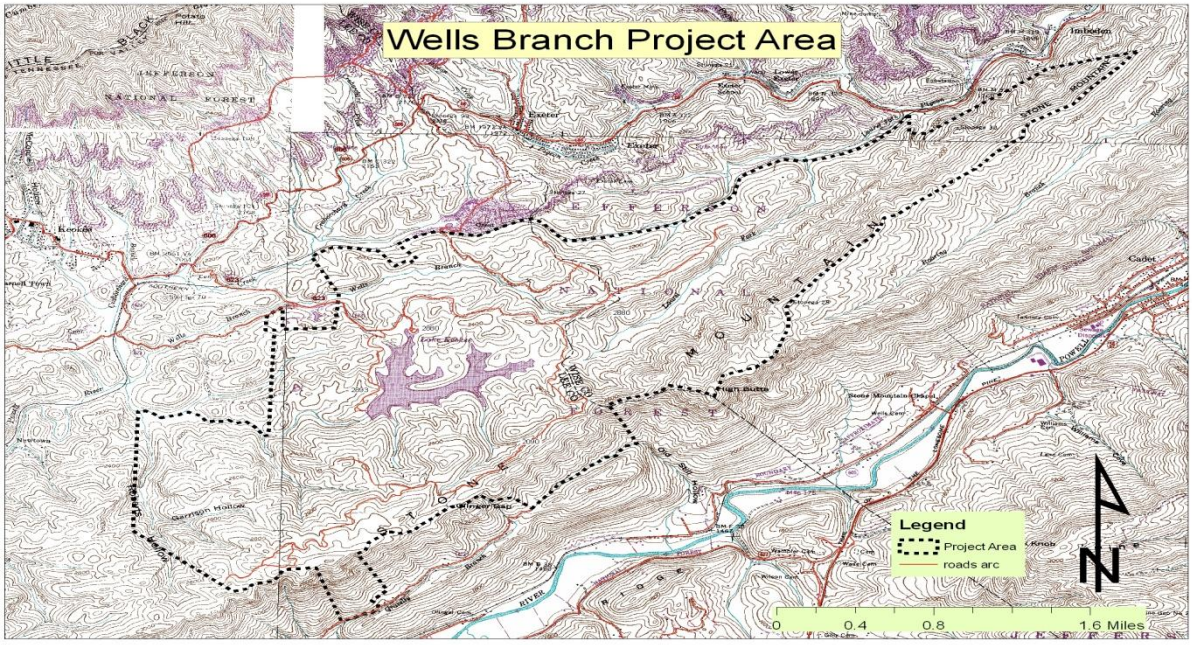


Figure 1: Wells Branch Project Area Map

1. 2 Proposed Action

The following summary discusses the vegetation management actions proposed, harvest prescriptions and objectives, acres, and transportation needs. Chapter 2 of this Environmental Assessment (EA) provides

more detail regarding the proposed action, including stand management objectives; post-harvest treatments, and a description of desired residual stands. The following is a summary of the proposed Vegetation Management as well as associated transportation and recreation oriented projects.

- **Timber Harvest** Removal of all timber would be through ground based (i.e. skidders and tractors) equipment. Natural regeneration will be accomplished from coppice, stump sprouting, and seeding.
    - **Regeneration (coppice w/reserves)** is proposed on approximately 200 acres
    - **Regeneration (shelterwood)** is proposed on approximately 85 acres
    - **Stand Improvement (free thinning)** is proposed on approximately 176 acres.
- **Prescribed Burning** is proposed on approximately 2900 acres to treat slash and woody fuels in regenerated stands and site preparation for natural regeneration. Other objectives would include reduction of fuels, to begin the process of changing the fire regime condition class, to improve stand composition, and to promote herbaceous growth in the understory. Natural features such as creeks and wet areas will be used along with roads and trails as primary control lines. Approximately one half mile of fire line will be created using hand tools. Dozer line will not be used as part of this project.
- **Transportation Needs**
    - **Approximately 1.1 miles of new system road construction**. This road will be closed to the public during and after project implementation.
    - **Approximately 1.2 miles of temporary road construction is proposed**. Following completion of the proposed management activities, all landings, temporary roads and constructed fire lines will be re-vegetated. All temporary roads will be closed to all vehicle traffic.
    - **Pre-haul maintenance** would be completed on Forest Service Road (FSR) 2880 and FSR 2090.
- **Post-Harvest Treatments** proposed include:
    - **Seeding** all landings, temporary roads, and portions of some skid roads with a quality wildlife seed mix to create approximately 20 acres of wildlife openings/strips.
    - **Mechanical (chainsaw) stand improvement and mid-story treatement** on areas that are commercially thinned.
    - **Mechanical (chainsaw) and herbicide site preparation** on areas that are regenerated through coppice.

1.3 Forest Plan Direction

The Forest Plan is the first level of decision making process that satisfies many requirements of the National Forest Management Act (NFMA, 1976). It sets direction for the Forest Service to make site-specific proposals and to implement these proposals over time. The plan identifies various desired conditions and objectives specific to different areas of the forest. The primary purpose for the Wells Branch project is to move the existing conditions within the Management Prescription 8A1 – Mix of successional Habitat lands in this area toward the desired conditions and objectives for these lands.

The Wells Branch project area encompassed by compartments 2088, 2089, 2090, and 2094 contains several management prescriptions (Rxs) within its 3,805 acres (see Rx map in appendix). The majority of the project area is a contiguous block of **Rx 8A1 – Mix of Successional Habitats in Forested Landscapes**. This management prescription is intended to ". . . Provide a mix of habitats for plants and animals associated with mid-to late-successional forest habitats." The 8A1 management prescription is designated as "suitable for timber production".

Several Rxs surround Lake Keokee. There is an **Rx 4D - Botanical – zoological area** of about 300 acres around to the north and south of Lake Keokee. Areas with the 4D prescription ". . . serve as a network of core areas for conservation of significant elements of biological diversity." (RLRMP 3-27). No harvesting or road construction is planned in this 4D area.

Management Rx 7B - Scenic Corridors surrounds much of Lake Keokee (about 500 acres). This prescription has an emphasis on ". . . providing, through maintenance or restoration and design, high quality scenery in sensitive recreational and travel way settings." (RLRMP 3-88). The "recreational setting" in this case is Lake Keokee. These areas are "suitable for timber production". "Timber harvest practices are modified to recognize and enhance the aesthetic and recreational values of these lands." (RLRMP 3-88). Only a small portion of one regeneration unit lies within Rx 7B.

The project area also contains management prescription **7D - concentrated recreation area**. These areas are managed "to provide the public with a variety of recreational opportunities in visually appealing and environmentally healthy settings." (RLRMP 3-96). This area is only about 15 acres and is centered on the parking and boat launch area at Lake Keokee. No harvesting is planned in the Rx 7D area.

Embedded through most Rxs are **Rx 11- Riparian Corridors**. These areas are found along all defined perennial and intermittent stream channels that show signs of scour, and around natural ponds, lakeshores, wetlands, springs, and seeps. They are managed to retain, restore, and/or enhance the inherent ecological processes and functions of the associated aquatic, riparian, and upland components within the corridor. No harvesting or road construction will occur in Rx 11 areas.

A small area of **Rx 6C – Old Growth Forest Communities Associated with Disturbance (56 acres)** is found along the eastern boundary of compartment 2088 but is not near any project activities.

The compartment boundaries for this project area also cross very small pieces of two other Rxs but do not involve any of the management activities.

1.3.1 Existing and Desired Conditions

The Forest Plan provides guidance in establishing the desired condition for resources within a project area based on site-specific factors such as the management prescription designation, featured habitat designations for species types, and forest type. The following is a brief summary of the existing condition

and desired condition for project area resources. Additional discussions on existing and desired condition are provided in chapter 3 of this EA.

Desired Conditions

The entire project area lies within Management Area 10, the Powell River-Stone Mountain Management Area. This management area is located within the coalfields region of southwestern Virginia. Most of this Management Area emphasizes dispersed recreation or remote recreation with the Cave Springs wilderness study (now designated as Stone Mountain Wilderness) and Roaring Fork Wild and Scenic River Study areas, along with the existing Lake Keokee and Cave Springs recreation areas. Roads are located and maintained so as to maintain slope stability. The aquatic diversity of fish and mussels are maintained, enhanced or restored into previously occupied habitat where suitable. Beneficial uses are maintained or improved while recreation use continues and while natural gas exploration and development proceeds. There are no objectives specific to this management area (RLRMP, pp. 4-32 through 4-34).

The Forest Plan desired condition for Rx 8A1 – Mix of Successional Habitat Areas (RLRMP, pp 3-112 through 3-114) in terms of wildlife habitat provide for mid to late-successional forest greater than 40 years of age dominates the landscape. The area is also interspersed with forest communities greater than 100 years of age and herbaceous openings, providing diversity for both wildlife habitat and scenic attractiveness. In addition, 4 to 10 % of the contiguous prescription area is in early-successional forest. Many patches of these early successional habitats are greater than 20 acres in size to provide optimum habitat for these early successional species. The overstory canopy generally consists of mixed hardwood forest composed primarily of oaks and hickories (hard mast producers) in the uplands and are relatively closed, multi-layered, and moderately to densely stocked. Timber management to maintain and enhance hard mast production, especially oaks, is designed to establish and maintain reproduction of a diversity of tree species of mast bearing age in dominant and co-dominant crown classes. Trees with open-grown crowns receiving plenty of sunlight produce the most acorns and the creation of openings 2 acres in size and greater to get full sunlight on the forest floor helps maintain oak regeneration as well as stimulate soft mast and browse production. Maintenance of a diversity of forest age classes is also important in these areas to provide soft mast and herbaceous vegetation. The resulting landscape structure of this land allocation provides a forest matrix appropriate for linking large and medium-sized late successional to old growth patches.

Prescribed fire plays an important role to encourage oak sprouting and reduce competition from more shade tolerant species. Prescribed fire and commercial timber harvest are employed to maintain the hard mast producing capabilities of the forest communities containing oaks and hickories.

Management activities (RLRMP, p. 3-112) are designed to:

- Retain forest cover across the Rx area;
- Increase spatial heterogeneity by increasing both early and late successional habitat conditions;
- Increase vertical vegetative diversity (canopy, sub-canopy, shrub, herbaceous layers all present and fairly well represented);
- Maintain or enhance soft mast production; and
- Limit motorized access across the Rx area.

Forest Plan objectives and standards (RLRMP, pp. 3-114 through 3-115) for Rx 8A1 areas to achieve the desired conditions are:

1. 8A1-OBJ1 Maintain a minimum of 60% of the area greater than 40 years of age.
2. 8A1-OBJ2 Maintain a minimum of 20% or greater of the area in late-successional to old growth forest conditions greater than 100 years in age.

3. 8A1-OBJ3 Maintain a minimum of 4 percent of the prescription area in early successional forest habitat conditions (stand age less than 10 year, openings 2 acres in size and greater). Standard 8A1-010 further states that regeneration harvests range in size from 2 to 40 acres. Standard 8A1-013 states that regeneration harvests may occupy up to 16% of a project analysis area in order to provide 4-10% of an individual contiguous management prescription in early successional forest habitat conditions and to cluster these conditions on the landscape.
4. 8A1-OBJ4 Maintain an open road density at or below 1.25 miles per square mile (applies to National Forest System roads only)

In addition, Forest-wide Goal 15 (RLRMP, p, 2-32) also can be met with this proposed action:

Goal 15 Where forest management activities are needed and appropriate to achieve the desired composition, structure, function, productivity, and sustainability of forest ecosystems; a result of such activities will also be to provide a stable supply of wood products for local needs.

Existing Condition

Spatial Heterogeneity. Table one shows the Successional stages present and their relative abundance in both the project area and the Contiguous 8A1 management area. Late Successional stages dominate the landscape. The age-class distribution for the contiguous Rx 8A1 area is approximately 58% in the late (81-100 years old) Successional stage. Similarly the late successional stage represents about 57% of the project area as a whole. The mid successional stage is represented on about 25% of the project area as a whole and 22% of the contiguous 8A1. Sapling and Pole successional stages occupy about 9% of the project and contiguous 8A1 areas. The project area and contiguous 8A1 area both lack early successional habitat and contain only about 1% of this successional stage. Most of this one percent is the result of prescribed fire creating openings in young stands. The old successional stage (101+ years old) represents about 8% of the project area and 10% of the contiguous 8A1. This late stage vegetation will occupy a larger percentage of the project area in the future as the late stage ages and passes the age of 100.

Table 1: The approximate percentage of the project area by age class

Successional Stage	Early 0-10 yrs	Sapling/Pole 11-40 yrs	Mid 41-80 yrs	Late 81-100 yrs	Old 101+ yrs
Project Area (App 3,900 Ac)	<1% (32ac)	9% (336 ac)	25% (985 ac)	57% (2213 ac)	8% (313 ac)
Contiguous 8A1 (App 3,230 ac)	1% (32 ac)	9% (296 ac)	22% (716 ac)	58% (1866 ac)	10% (313 ac)

Vertical Vegetative Diversity. Stand structure is an important factor in suitable wildlife habitat. High stand densities limit the amount of sunlight reaching the ground, thereby decreasing within and between stand structural diversity. In addition, because of the limited light reaching the ground, less desirable species such as red maple, magnolia, and birch increasingly dominate the understory.

Currently, the general condition of the forest across the project area is overstocked. Most stands are 71-90 years old, and have received no species or stocking control. Average Basal Area (BA) for most stands is around 110 sq. feet. Forests grown under these conditions are increasingly susceptible to insect attack and disease. With increased mortality from insect and disease outbreaks, the potential for catastrophic fire also increases. Tree quality across the project is average and where overstocking occurs, growth is relatively slow. The project area lacks age class diversity, contains very little edge habitat, and very little early successional habitat. Recent prescribed burns in the project area have had desirable effects including mid-story mortality that opened up stands allowing more sunlight to reach the forest floor and, as a result, increasing herbaceous growth and diversity of species on the ground. Some overstory trees were also killed during recent prescribed burns. This overstory mortality has created canopy gaps and scattered

small patches of early successional habitat. TSI (timber stand improvement) treatments were also implemented on 8 younger stands in 2005. These treatments improved the species composition and health of the stands regenerated in the 70's and 80's. More information on the existing and desired condition of the project area can be found in chapter 3.

1.4
Purpose and Need for Action

Comparing the existing conditions to the desired conditions and objectives for the Rx 8A1 area identifies several opportunities to move the area closer to the desired (Table 2). The following purposes for this proposal and associated needs for the action are as follows:

Purpose #1: To create increased spatial heterogeneity by increasing both early and late successional habitat conditions in the current age class distribution.

Forest Plan Objectives	Existing Conditions	Opportunity and Need for Action	Proposed Action (at the end of the 10 year entry period)
8A1-OBJ1: Maintain a minimum of 60% of contiguous block >40 years of age, at least 1,938 acres	2,895 acres (90%) of 8A1 management prescription area is > 40 years	Objective met	2838 acres (87%) of 8A1 Management prescription area is > 40 years
8A1-OBJ2: Maintain a minimum of 20% of the area in late-successional to old growth forest conditions > 100 years of age, at least 646 acres	313 acres (10%) of 8A1 area is > 100 years	Lacking 333 acres	This objective will be attained in 2020
8A1-OBJ3: Maintain a minimum of 4% and up to 10% in early successional forest habitat conditions (stand age less than 10, openings 2 acres or greater), at least 129 acres, up to 323 acres	32 acres (<1%) 8A1 management prescription area currently is in early successional habitat	Need early successional habitat. Create early successional habitat in the management prescription area (129 ac to 323 acres) to achieve the 4 – 10% range	285 acres (9%) of 8A1 Management prescription Area is 0-10 years
8A1-OBJ4: Maintain an open road density at or below 1.25 miles per square mile (National Forest System roads only)	Open road density in 8A1 area is currently .21 miles per square mile	Objective met	New system road will be closed for public use so objective will still be met

Table 2. Forest Plan Objectives vs. Existing Conditions for the Rx 8A1 area. Differences between the objectives and the existing conditions identify opportunities and needs for action. The proposed actions are conditions after implementation of the proposed action (10 years out).

Need: The majority of the project area is located in management prescription 8.A.1 as described in the Revised Land and Resource Management Plan for the Jefferson National Forest. This management type is intended to "sustain a mixture of successional habitat distribution across the landscape with emphasis increasing the spatial heterogeneity by increasing both early and late successional habitat conditions" (RLMP p. 3-112) as shown in Table 1.

Currently, upland oak/hickory and yellow poplar/white oak/red oak forests greater than 40 years dominate the prescription area with approximately 90% of the area greater than 40 years of age. There is virtually no early successional habitat in the project area or in the prescription area (Table 1). According to the Forest Plan, regeneration areas may occupy up to 16% of a project analysis area in order to provide 4 to 10% in a contiguous management prescription block in early successional forest habitat conditions. These early successional habitat areas are often clustered on the landscape and provide optimum habitat for dependent species.

Although currently there are fewer acres than desired in the late and older age classes, there are many acres available that will mature into these age classes, even with the proposed harvests.

Purpose #2: To increase vertical vegetative diversity through manipulating stand structure.

Need: The management philosophy on suitable lands includes a planned periodic harvest applying biological and scientific principles to influence tree-species composition, control stocking, ensure adequate reforestation, facilitate harvesting of trees and protect the productivity of the site while providing for a healthy vigorous forest within the growth capabilities of the sites (RLRMP 2-30).
Currently, many of the stands in this project area are overstocked. The average BA of these stands is approximately 110 sq.ft/acre, of which, an approximate average of 50% of the overstory stocking is less desirable, non-mast producing species, such as red maple, magnolia, or yellow poplar. The resulting stands,

- have little or no within-stand structural diversity (little or no amounts of shrub/brush soft-mast or seedling/sapling layer),
- have lower growth/vigor and,
- contain less desirable species which out compete desirable mast bearing species.

The RLRMP calls for the use of silvicultural systems, including commercial thinning, to provide for structural diversity (RLRMP, FW – 70, 2-26). Removing a variety of overstory trees would increase the amount of sunlight reaching the forest floor which increases structural diversity (RLRMP 3-115). Decreasing the number of trees in a stand will result in reduced competition for sunlight, water, and nutrients. This will result in increased growth and vigor, increased mast producing capability, and increased capacity to resist insects/diseases, thereby moving the project area towards the desired future condition (RLRMP 3-112 and 3-113). Prescribed burning is another tool proposed for this project area to increase structural diversity in the stand.

1.5 Project Objectives

The following project objectives will achieve the purposes of increasing spatial heterogeneity and vertical vegetative diversity:

1. **Create early successional habitat**
2. **Increase growth and vigor**
3. **Maintain or increase oak component**
4. **Re-introduce fire into the ecosystem**
5. **Provide raw wood material to local markets**

Objective 1: Increase the acreage of early successional forest habitat in this portion of management prescription 8-A-1. Approximately 3230 acres of contiguous land is present in the 8-A-1 management prescription, and approximately 1% contains early successional vegetation (stands less than 10 years old). The proposed timber harvests will create approximately 285 acres of ESH in the project area, bringing the total of ESH in the contiguous (8A1) land base to about 9%.

Objective 2: Improve the growth and vigor of stands adjacent to the ESH created by our proposed action. Growth and vigor of selected trees will increase after competing vegetation is removed during proposed thinning harvests. The increased growth and vigor will help the treated stands resist insect infestation, the occurrence of disease, and would increase production of hard and soft mast in the project area.

Objective 3: Manipulate species composition. The proposed action (including both timber harvests and prescribed fire) would increase the amount of sunlight reaching the ground therefore should encourage regeneration of more desirable timber and wildlife species. One objective is to maintain or increase the amount of hard mast in a stand. This can be accomplished by favoring the retention of oak during thinning operations. Another goal is to increase the diversity of species in the understory. Prescribed burning helps accomplish this as do canopy openings created during selective timber harvesting.

Objective 4: Re-introduce fire into the Appalachian Mountain ecosystem. Historically, fires burned more frequently than they do in this age of fire suppression (Sutherland et al, 2008). Prescribed burns are intended to manipulate the species composition, increase structural diversity, increase browse, and reduce less desirable vegetation in the understory, resulting in improved wildlife habitat and improved species composition. This action would also reduce fuels available for wildfire and mimic the historic fire regime found in this forest type in the Appalachian Mountains (Sutherland et al, 2008).

Objective 5: Provide raw wood material to local markets. Trees and the products derived from them are a highly valued forest resource. Objective 15.01 provides for a total Timber Sale Program of 4.0 million cubic feet (MMCF), or 22 million board feet (MMBF) annually (RLRMP, p. 2-32). The majority of our project area has been designated as suitable for timber production. Given the congruent wildlife habitat goals, it is logical to market the wood products created by our proposed action.

1.6 Scoping/Public Involvement

A scoping letter, dated August 8, 2007 was posted on the forest correspondence database and mailed to all groups and individuals on the scoping list (approximately 75). A request for public comment was printed in The Coalfield Progress on August 9, 2007. Due to elapsed time and changing conditions a second scoping was sent out on May 27, 2010 with the notice appearing in the Coalfield Progress on June 1, 2010.

The initial scoping effort generated 6 responses to the proposed action and potential alternatives; One phone call from an interested private citizen, two letters from special interest groups, and three letters from State agencies. The second scoping generated three letters (some were copies of the original letters) and one phone call. All responses were carefully reviewed and a list of comments was generated as a result. The Interdisciplinary Team (ID) team then met and discussed the comments and the issues they raised. The team then determined which resources and issues needed to be analyzed in detail, and/or addressed in the EA. Many of the responses had similar themes that were repeated within and between the letters and/or commenter. See appendix B for specific responses to comments received.

In addition to these scoping periods a draft of the environmental assessment was released in September 2011 and a public informational meeting was held in Keokee, VA to answer questions from the public. About 30 or so people attended the meeting and expressed enough interest that an additional two week

comment period was added. This comment period generated a number of e-mails and one written letter. No new project related issues were raised as a result of this latest comment period.

1.7 Issues

Four issues identified during the scoping process were considered in detail and carried forward in the analysis of this project.

Issue #1: Ground-disturbing activities could result in sedimentation of adjacent streams, causing reduced water quality and aquatic habitat in those streams as well as the Powell River.

Indicators – Water quality: *% increase of sediment yield over background levels at designated critical reaches – tons/acre/year*
Riparian Areas: *acres disturbed*

Issue #2: Management activities adjacent to Lake Keokee will significantly impact the visual quality of the viewshed.

Indicators – *Management activities meet the Scenic class objectives for the project area*

Issue # 3: – Management activities could have a negative impact on TES habitat within the project area.

Indicator – *Effects determination by species*

Issue # 4: Management activities could have a negative impact on MIS habitat in the Wells Branch Project area.

Indicator – *% affected habitat by species*

1.7.1 Issues considered but not carried forward in detailed analysis

The following issues were discussed during the comment analysis process, but were dealt with in the project design features and mitigation measures or agency policy. They were not carried forward in the analysis.

Impacts of fragmenting habitat

The fragmentation of forests (mature or not) is a concern that the Forest Service considers at the Forest Plan level. In general, fragmentation of the forest occurs when a land-use is permanently changed from a forested environment, not when timber harvesting occurs. This project does not propose any permanent change to the forested environment; the proposed action is within standards and guidelines set forth in the Forest Plan for Mgmt Rx 8A1. As a result, the IDT decided that this issue would not be carried forward into detailed analysis.

Impacts on old growth

The RLRMP states "There are no existing large (>2,500 acres) patches of old growth found on the Jefferson National Forest". However, large areas unsuitable for timber harvest have been identified and are set aside for future large patches of old growth (FEIS, 3-117). A specific project area analysis is not used to delineate large patches of old growth. The forest plan is where landscape level decisions are made. Medium and small patches were also identified as a part of the Forest Plan process using the Regional guidance. These were to be used to improve spatial distribution between large patches of old growth (RLRMP, B-1). While large, medium and small patches were identified solely in conjunction

with the Forest Plan, medium and small patches could also be identified as a part of the project area analysis.

The desired condition for late successional/old growth forested conditions greater than 100 years in this management prescription is 20% across the contiguous management prescription area, or approximately 646 acres. Currently, none of the stands within the prescription area currently meet all four Region 8 criteria for old growth as defined in *Guidance for Conserving and Restoring Old Growth Forest Communities on National Forests in the Southern Region*, nor does the area meet the 20% objective for late successional conditions. Further analysis indicates that the prescription area will achieve this late successional objective within 13 years (2020). This project does not propose to harvest stands greater than 100 years old although a portion of one stand proposed for cutting is over 100 years and individual 100 year old trees may be found in other stands proposed for cutting. Harvesting the planned acres will not change the status of the late successional deficit nor will it retard the achievement of this objective in 13 years. In addition, the creation of late-successional to old growth characteristics was not defined as a purpose and need for this project. As a result, the IDT determined that this issue would not be carried forward into detailed analysis.

Impacts on cultural resources
An archeological survey and report was conducted for this project (project file). The Forest Service recognizes the importance of protecting cultural sites and, in general, excludes all archeological sites from management activities. No archeological sites were found during the surveys conducted for this analysis. One old cemetery was identified during the scoping process and will be protected during any harvesting activities in the area. The ID team decided that this issue would not be carried forward into detailed analysis.

Effects on economics
The IDT recognized the value of this area to the local community, for not only recreational use (hunting and hiking), but as a source of potential revenue to the local community. It is likely that improved wildlife habitat conditions would attract more hunters and hikers to the area. This increase in forest visitors would have a positive impact on the local economy. The value of keeping National Forest timber revenue flowing through the local economy is also an important consideration and an economic analysis was completed to weigh the benefit/cost ratio and the present net value of all activities in each alternative (Economic Analysis: Project File). Based on this information, the ID team determined that this issue would not be carried forward into detailed analysis.

Impacts to soils
Protecting soil productivity was a key consideration in the formulation of the proposed action and design features of this project and the interdisciplinary team determined that a soils analysis was necessary. The Forest Soil Scientist examined the area and completed the analysis. The resulting analysis identified no severely erosive soils, and found that management activities would be well within the Forest Plan Standards for soil disturbance (Project file: Soil Resource Report for the Existing Conditions and the Estimated Effects for this Proposed Project). As a result, the ID team determined that this issue would not be carried forward into detailed analysis.

1.8 Scope of the Analysis

The Final Environmental Impact Statement for the Forest Plan will guide this analysis. Together with the Forest Plan, these documents provide the programmatic, or first, level of the two level decision process adopted by the Forest Service. These documents satisfy many requirements of the National Forest Management Act (NFMA 1976) while providing programmatic guidance.

The Final Environmental Impact Statement for Vegetation Management in the Appalachian Mountains (VMAM) will also be referred to for the effects analysis related to the use of herbicides and chainsaws.

All of these documents are available for review at the George Washington and Jefferson National Forests Supervisor's Office, 5162 Valleypointe Parkway, Roanoke VA 24019 or the Clinch Ranger District, 9416 Coeburn Mountain Road, Wise VA 24293.

Chapter 2: Alternatives

- **2.1 Introduction**
- **2.2 Alternatives Eliminated from Detailed Analysis**
- **2.3 Alternatives Considered in Detail**
- **2.4 Alternative Formulation**
- **2.5 Mitigation Measures**
- **2.6 Monitoring**

2.1 Introduction

This chapter describes the various alternatives developed by the IDT designed to respond to the resource needs of the project area and to specific issues and concerns identified through the public scoping process. Alternatives were designed with an interdisciplinary approach considering:

1. the size and scope of the project,
2. the purpose and need,
3. the issues,
4. the expected environmental impacts.

The alternatives include mitigation measures and monitoring requirements. This chapter also provides a brief comparison of the alternatives. This information, along with the disclosure of projected environmental consequences in Chapter Three and in other included analysis found in the project file, provides the decision-maker with the information necessary to make a reasoned choice between the alternatives. Alternatives considered but eliminated from detailed analysis area also briefly described.

2.1.1 Past Actions Relevant to Current Resource Conditions

Vegetation in the project area has been modified over the years preceding this analysis primarily from extensive timber harvests around the turn of the century (1890-1910). Later, some harvesting was associated with the decline of the American chestnut. The Forest Service conducted some timber sales in the area during the 1980's and early 1990's. Timber stand improvement was implemented on these younger stands in 2004 and 2005.

2.1.2 Present Actions of Relevance

Habitat management in the project area has occurred in limited amounts in the past. Underwater habitat has been manipulated by drawing down the lake and cutting snags that were left standing when the lake was created. Several prescribed burns have been completed in the past ten years. Extensive timber harvesting and coal mining has occurred in recent years on private land adjacent to the project area. No other known or foreseeable actions are planned or have taken place in or adjacent to the analysis area.

Several yards on private property immediately adjacent to the project area are planted grass. The District Biologists determined these areas do not meet forested early successional habitat conditions and will not be used for early successional habitat acreage. Wildfire in the area has been suppressed quickly due to the proximity of homes near the project area. Recreation in the area includes boating, fishing, hunting, and hiking.

2.1.3 Silvicultural Prescriptions

This section describes each treatment type, including treatment objectives and a description of each stand post-treatment. Trees would be removed through commercial timber sales under the silvicultural systems described below.

a. Coppice with Reserves – This is a regeneration treatment. The purpose of this treatment is to provide early successional habitat for a variety of wildlife and plant species including: deer, ruffed grouse, and various songbirds. It provides a distribution of wildlife and plant habitat diversity across the landscape and raw wood materials to the local market. It also promotes hardwood regeneration while maintaining an overstory hard mast component.

A residual BA of approximately 15-25 sq.ft./acre of mostly oaks and other hard mast species would remain, including wildlife reserve trees. This would average about 10-40 trees/acre in about the 10 – 25" diameter at breast height (DBH) range. Non-commercial trees less than 6" DBH would be cut during post-harvest treatments as needed to meet regeneration objectives. This post-harvest action is referred to as site preparation and the effects are considered a part of the regeneration harvest.

b. Standard Shelterwood – This is a two stage regeneration treatment. The purpose of this treatment is to provide early successional habitat for a variety of wildlife species, including deer, ruffed grouse and various songbirds. This treatment reduces the sunlight reaching the ground, which also can reduce the vigor and number of intolerant regeneration, such as yellow poplar and red maple. These treatments also reduce the impact of harvesting activities on the visual resource.

A residual BA of approximately 30 – 50 ft^2/acre of a diversity of hard mast, soft mast, and wildlife reserve trees would remain. An average of approximately 25 to 60 trees/acre with a DBH range of 12 to 24 inches is desired. Non-commercial trees less than 6" DBH would be cut during post harvest treatments. Site preparation effects are considered a part of the regeneration harvest.

c. Free Thinning – This is a cultural treatment designed reduce stand density of trees primarily to improve growth, enhance forest health, control species composition, and recover potential mortality. The stand is marked to leave an average residual BA of approximately 60-80 sq.ft./acre of dominant and codominant trees. The leave trees would be chosen to control stand spacing and to favor desirable trees, using a combination of thinning criteria without regard to crown position. Non-commercial and less desirable vegetation in the understory would be reduced through the use of chainsaws and prescribed fire after harvesting is complete. The post-action use of chainsaws to control less desirable non-commercial stocking will improve understory shrub, brush and herbaceous component, and the effects are considered a part of the thinning treatment.

d. Prescribed Burning – To deliberately burn wildland fuels in either their natural or their modified state and under specified environmental conditions, which allows the fire to be confined to a predetermined area and produces the fireline intensity and rate of spread required to attain planned resource management objectives.

In this case the management objectives for prescribed burning include: the reduction of fuels, control of thin barked species such as red maple, and the enhancement of herbaceous growth in the understory. This would improve species composition, promote the development of oak in the understory, and improve the shrub, brush and herbaceous component. Restoring the historical presence of fire in the ecosystem, under a controlled environment, is a management objective for the Wells Branch project area.

2.2 Alternatives Eliminated from Detailed Analysis

The following is a summary of alternatives considered by the ID team, but eliminated from detailed analysis and the rationale for dismissal.

Cut and Leave
This alternative would meet the purpose and need for the project area by creating ESH without entering stands with machinery. All trees would be cut by chainsaw to create similar browse habitat without removing any of the timber that was cut. Estimated direct costs/acre:
Regeneration

- $2.25/tree * 150 trees/ac = **$337.50**/ac. $337.50/ac * 285 regeneration ac = **$96,187.50** for project.

Intermediate Treatments

- $2.25/tree * 40 trees/ac = $**90.00**/ac. $90.00/ac * 176 thin ac = **$15,840** for project.

Total project cost = $ 112,027.00

With no revenue being generated to offset this cost, this alternative was not considered practical. Also, the habitat conditions created by cut and leave would have limited wildlife value due to large amounts of woody debris remaining post treatment. The dense downed timber would represent a fire hazard by drastically increasing project area fuel loading. While the direct impacts to soil resources might be decreased, the risk of catastrophic fire in these areas greatly increases. Catastrophic fire increases the risk of severe damage to soil resources. Therefore, this alternative was dropped from detailed analysis.

All Thinning and/or Uneven-aged Management
An uneven-aged management, individual tree selection, and/or thinning alternative was considered by the ID Team. The Forest Plan provides guidance for ESH requirements within the project area on page 3-115. To manage the project area with only thinning or individual tree selection would not create the ESH standards set forth in the Forest Plan (8A1 – 013). Uneven-aged management is also implemented using group selection harvests where openings are limited to two acres in size. The Forest Plan has established standards for uneven aged management, which include a contiguous block of 100 acres with < 30% slope (FW-119, pg. 2-34). There are no blocks of land within the proposed project area that meet this criteria, therefore uneven-aged management was dropped from detailed analysis.

A long rotation alternative (200-300 + years) was also considered by the ID team. The Forest Plan provides guidance on rotation ages (p. 3-115), and in the general age-class structure (8A1 OBJ1, OBJ2, p. 3-118), which includes the provisions for regeneration prior to rotation age to 'meet long-term desired condition of a particular management prescription' (Forest Plan, FW-113 pg. 2-33). Many Appalachian hardwood (cove and upland oak types) species show signs of reduced vigor by age 100 with increasing mortality between 100 and 200 years. To manage most stands for greater than 200 years would drastically reduce the economic feasibility of harvest and vegetative ability to regenerate hard mast species (red and white oaks and hickories). As a result, the desired condition of the project area would not be met on an extended rotation. Therefore, an all thinning and/or uneven-aged management alternative was dropped from detailed analysis.

Clearcutting
An all clearcutting alternative was considered by the interdisciplinary team. An alternative that would involve clearcutting was considered, but eliminated from detailed study because of the current effort to reduce clearcutting acres. A commitment was made in the Revised Jefferson Land Resource Management Plan to reduce clearcutting as a result of social considerations. Scientifically, it has been determined that clearcutting does not result in noticeably improved regeneration (number of stems per acre and species composition) as compared to the seedtree and shelterwood harvests. Therefore, clearcutting was eliminated from detailed study since the desired condtion for regenerating the area can be met with a modified shelterwood while meeting our commitment to reduce clearcutting.

Ecosystem restoration
An ecological restoration alternative was suggested during scoping but not considered in detail for two reasons. First, ecological restoration has not been defined as it relates to this particular project area. Comments received from scoping indicated a possible desire to see an approach such as used by the Cherokee National Forest where the sites most departed from a natural range of variation have been identified for treatment and restoration. The Jefferson National Forest has not yet been mapped using the same ecological methodology as used by the Cherokee National Forest, therefore there is no basis yet for determing what the natural range of variation, nor the degree of departure. At this time, evaluation of need for management is based on the spatial and vertical diversity needs identified in the Forest Plan. Second, the ecological restoration alternative suggested during scoping only included uneven-aged harvests and single tree selection. We do not agree with the comments that the even-age regeneration methods using coppice with reserves and shelterwood are not appropriate restoration treatments. Coppice with reserves treatments would an average of 15 – 25 BA (10 to 40 trees per acre) of hard mast, soft mast and wildlife reserve trees, and allow regeneration to occur via stump sprouts and seeding. Research and experience on sites with similar site-specific conditions show that natural regeneration will occur in sufficient quantities to achieve NFMA requirements regarding post harvest regeneration. While the retention of trees would partially shade the understory, monitoring of past two-aged treatments cut in similar stands have shown that required levels of regeneration can be obtained with this treatment. This harvest method would also provide hard mast production in the stand and maintain vertical structure beneficial to wildlife species requiring these characteristics. For these reasons, this method is appropriate for achieving the objective of managing for vigorous two-storied, two-aged hardwood stands, which would provide wildlife browse habitat in the short term, and hard mast and vertical structure in the short and long-term. Standard shelterwood treatments are a two-stage regeneration treatment. The purpose of this treatment is to provide early successional habitat for a variety of wildlife species, including deer, ruffed grouse and various songbirds. This treatment would retain 30 to 50 ft^2/acre of BA, retaining a variety of hard mast, soft mast, and wildlife reserve trees. Studies and experience on sites with similar site-specific conditions show that natural regeneration will occur in sufficient quantities to achieve NFMA requirements regarding post harvest regeneration. This treatment reduces the sunlight reaching the ground (as compared with other regeneration treatments), which also can reduce the vigor and number of intolerant regeneration, such as yellow poplar and red maple. These treatments also reduce the impact of harvesting activities on the visual resource. Once regeneration is established, an overstory removal can occur if needed.

For these reasons, the ecological restoration alternative was not analyzed in detail. No early successional habitat would be created, therefore the purpose and need would not be met for the project area nor would the project area move toward the desired condition for management prescription 8A1, which calls for a mixture of successtional habitats.

All Horse Logging
An alternative that would utilize horse logging was suggested and considered by the IDT. An overwhelming majority of the area is too steep for animal logging. Most horse logging is completed in areas where slopes are less than 20% and skids are less than 400 feet. There is only a small portion of the project area that would meet this requirement. If we examined just those areas that could be animal logged, the resulting project would not meet the purpose and need for the project. Therefore, this alternative was dropped from detailed study.

No Road Construction
New road construction was generally viewed negatively in the comments received during scoping. As a result the ID team looked at a no new road construction alternative. This was eventually dropped as a

separate alternative, but the amount of road construction was significantly reduced from the original proposed action (from 2.0 miles in the 2007 scoping letter to 1.1 miles of proposed system road construction in the 2010 scoping letter). The ID team determined that some road construction was necessary in this area in order to meet the desired conditions for the project area set forth in the forest plan. This is because a large portion of the project area was not accessible enough to complete needed management activities. The proposed new system road construction will provide access to these previously in-accessible stands that would benefit from work now and in the future. The current needs are for early successional habitat creation and improvement thinning in these stands. In the future, the new system road would be used to complete site preparation, timber stand improvement, wildlife and timber monitoring, exotic species control, and fire management. The new system road would also provide needed foot access for hunters and hikers. The ID team did not feel that new road construction would increase illegal ATV use. Open road density would not be affected because the new system road would be closed to motorized vehicles.

2.3 Alternatives considered in detail

The interdisciplinary team analyzed two alternatives for this project area: the no action alternative and the proposed action hereafter referred to as alternatives 1 and 2 respectively. Table 3 provides an overview of the different alternatives.

2.3.1 Alternative Formulation – The alternatives listed below were all carefully considered by the ID team during the analysis.

Table 3. Comparison of all actions by alternatives, including acreage treated, and miles managed

	No Action	Alt. 2
STAND TREATMENTS (acres)		
Approximate Acreage treated	0	3000
Regeneration	0	285
Thinning	0	176
Prescribed Burning	0	2900
Wildlife Opening Created	0	10
Herbicide Site Preparation	0	50
Spot Treatment of Noxious weeds	0	20
ROADS (miles)		
Road Construction	0	1.1
Pre-haul maintenance	0	5.0
Temporary Roads	0	1.2

2.3.2 No Action Alternative - This alternative (no new management activities initiated) is required by the Council on Environmental Quality {40 CFR 1502.12(d) and provides a baseline analysis for comparison with the effects of the other alternatives. This provides the Deciding Official with a clearer basis for a reasoned choice among the alternatives studied in detail. If project area was unmanaged for the next 50 years, the forest would grow into a large block of mature timber, providing habitat for mostly late successional species, but would not provide ESH that is necessary for early and mid-successional plants and animals. Furthermore, forest health would likely decline. This is a result of overstocking, in which tree vigor would be reduced, and thereby, increasing susceptibility to insects or diseases. This alternative responds to issue 1, 2, 3, and 4.

If the no action alternative were selected, the project area would not meet the Forest Plan standards for this management prescription in regards to ESH.

2.3.3 Alternative 2 (Proposed Action Alternative) - This alternative was outlined in the scoping notice sent out to the public. The proposed alternative includes about **285 acres of Standard Shelterwood and Coppice w/ Reserves harvests** in twelve blocks ranging from 10 to 40 acres (See Table 3), approximately **176 acres of free thinning**, approximately **2900 acres of prescribed burning**, and approximately **1.1 miles of system road construction.** FSR 2880 and FSR 2090 access the rest of the project area and would receive pre-haul maintenance. Approximately **1.2 miles of temporary road** is proposed to reach landing locations. **Post-harvest treatments** proposed include: disking and seeding approximately 20.0 ac of linear wildlife strip and openings, performing a herbicide and/or mechanical (chainsaw) site preparation in areas proposed for regeneration harvest, post-harvest mechanical (chainsaw) stand improvement in stands receiving intermediate treatment (thinning), planting of pine and hard mast species on approximately 100 acres, and manual/herbicide treatment of exotic species.

Table 4: Stand and Silvicultural Treatment Information

Compartment-Stand*	Unit Acres	Age	Forest Type**	Silvicultural Treatment
2089-4	27	76	53	Coppice with Reserves
2089-4	13	76	53	Coppice with Reserves
2089-4	25	76	53	Coppice with Reserves
2088-11	36	89	53	Coppice with Reserves
2088-1	28	89	53	Coppice with Reserves
2089-9	27	89	53	Coppice with Reserves
2094-7	13	106	53	Coppice with Reserves
2090-30	31	82	53	Coppice with Reserves
2090-19	19	101	53	Shelterwood
2089-12	11	83	53	Shelterwood
2089-10	34	76	53	Shelterwood
2089-16	21	76	53	Shelterwood
2089-3	5	76	53	Thinning
2089-16	34	76	56	Thinning
2089-9	8	76	53	Thinning
2089-18	27	76	53	Thinning
2088-11	14	89	53	Thinning
2089-4	28	76	53	Thinning
2090-8	33	82	53	Thinning
2094-6	27	86	56	Thinning

***** Some cutting units cross compartment/stand boundaries – the stand with the most area to be treated is listed.

**Forest type 53 – White Oak-Red Oak-Hickory
Forest type 56 – Yellow Poplar-White Oak-Red Oak

This action responds to all issues. Issue 1: By following Forest Plan standards and VA BMP's, sediment produced from harvest activities is minimal. Sediment produced from illegal ATV trails will be reduced by placing slash on all skid trails and other potential ATV routes. Issue 2: By using the design features

stated in section 2.4 of this EA and the Scenic Integrity Objectives (SIO) standards found in the forest plan, visual quality standards will be met. Issue 3: An effects determination is made in the BE to have no effect by following mitigations found in section 2.4 of this EA. Issue 4: By increasing vertical and horizontal structural diversity wildlife habitat diversity for a variety of species is increased.

PROJECTS ASSOCIATED WITH ALTERNATIVE 2 (proposed action)

1. Approximately 285 ac of regeneration harvest; 200 acres coppice w/ reserves, 85 acres standard shelterwood. 285 acres of natural regeneration w/ chainsaw site prep. Free Thinning; approximately 176 acres w/ Post Harvest Mechanical Stand Improvement.
2. Approximately 1.1 miles of system road construction.
3. Pre-haul maintenance on approximately 5.0 miles of FSR 2880 and 2090.
4. When practicable, utilize landings, temporary roads, and skid trails as wildlife openings/strips. Seeding will occur upon completion of use.
5. Approximately 2900 acres of prescribed burning in project area.
6. Herbicide site preparation where necessary (around 50 acres) and spot herbicide treatment of noxious weeds (about 10 acres)
7. Incorporate all design features and mitigation measures listed in section 2.4.

Table 5: Treatment acreages by purpose and alternative

Purpose #1: To create increased spatial heterogeneity by increasing both early and late successional habitat conditions	No Action	Alt. 2
Contiguous 8A1 Management Prescription Area		
Existing ESH (Pre-Harvest)	1% (32 ac)	1% (32 ac)
Existing ESH (**6-yrs Post-Harvest**)	0	9% (285 ac)
Permanent Wildlife Openings Created (acres)	0	20 ac
Project Area		
Existing ESH (Pre-Harvest)	1%(32acres)	1% (32acres)
Early Successional Habitat (**6-yrs Post-Harvest**)	0% (0 acres)	9% (285 ac)
Permanent Wildlife Openings (Created)	0	20 ac
Purpose #2: To manipulate stand structure and density		
Overstocked Stands (acres)	2000	1539
Acreage Treated		
Thinning (acres)	0	176
Regeneration (acres)	0	285
Prescribed Burning (acres)	0	2900
Total Acreage Treated	0	2988
*Note: All treatments utilized will create change in stand structure and/or density.		

2.4 Design Criteria and Mitigation Measures

The following are design criteria from the Forest Plan that are applicable to all action alternatives.

1. Stream crossings will be stabilized before road construction proceeds beyond the stream (VA state BMP's and RLRMP, 2-7, FW-1).
2. Timber, wildlife, and soils specialists will develop seed mixtures for soil stabilization
3. Irregular harvest area boundaries on regeneration units to maximize edge and reduce the visual impact (RLRMP, 2-48, FW-186). Shape and feather the edges of all units.
4. Slash will be placed in skid trails and existing ATV trails to discourage illegal ATV use.

5. Favor the retention of large (> 20" DBH.) standing snags and den trees when implementing silvicultural treatments (RLRMP, 3-114, 8A1 – 003)
6. Retain a diversity of hard and soft mast species to minimize yearly fluctuations in hard and soft mast production (RLRMP, 8A1 – 006, 3-115)
7. Roads will be used as unit boundaries where feasible (only corners will be painted where the road is the line).
8. Projects are designed to avoid, minimize, or mitigate negative effects on potentially significant heritage resources. Identified special archeological features will be protected under the timber sale contract (RLRMP, 2-50, FW-204).
9. Day lighting of all Forest Service system roads and temporary haul roads by removing overstory trees and brush adjacent to the road bed.
10. To ensure public safety, existing closed system roads will remain closed to the public during harvesting activities.
11. Removal of known Indiana Bat roost trees shall be avoided. If a roost tree needs to be cut for any reason, an informal consultation with the U.S. Fish and Wildlife Service (FWS) shall occur prior to removal (if possible). If a tree is identified as an immediate threat to public or personnel safety, it can be removed at any time, but preferably not before notification of an FS biologist and the FWS. If a tree must be removed prior to notification, FWS shall be notified as soon as possible. The removal would occur when the bats are in hibernacula (November 15 through March 15).
12. To reduce the potential for sedimentation from harvest activities and associated projects, riparian buffers are designed to meet and/or exceed all VA State BMP's and Forest Plan Standards.
13. Any slash that falls in a stream or onto private property shall be removed as soon as practicable.
14. Wildlife Trees will be white banded and protected under the sale contract.
15. A minimum average of 6 trees per acre $\geq$ 9" DBH shall be retained in all regeneration harvest areas to provide Indiana Bat summer roost habitat.
16. All shagbark hickories shall be retained in harvest units unless they pose a safety hazard. Any shagbark hickory felled for safety reasons will be tracked by the Timber Sale Administration team in inspection reports.
17. All skid roads/trails, temporary roads, and stream crossings are designated and approved by the Forest Service. All stream crossings will be as close to right angles as possible, and will meet Forest Service standards
18. Apply leave tree and unit marking so that it is not visible within 100 feet of Keokee loop trail.
19. Remove, burn, chip or lop/scatter slash to within 2 feet of the ground within 100 feet of Keokee loop trail.
20. Protect known occurrences of small whorled pogonia within the prescribed fire area by placing temporary fire lines constructed with a leaf blower around the site and misting the area periodically with water to prevent ignition from embers drifting into the site from the adjacent burn.
21. No application of herbicide in the immediate vicinity of the small whorled pogonia sites is allowed.

2.5 Monitoring Items

Monitoring is an important part of the environmental assessment process to assure that actions proposed by the selected alternative are carried out as planned and that the results are as predicted. In addition to general Forest Plan monitoring, the following project specific monitoring would occur with implementation of each action alternative as noted.

1. Timber sale layout would be monitored to insure that Forest Plan standards and guidelines, Virginia BMP's, the Indiana Bat Recovery Strategy and project-specific mitigation measures are carried out. Examples of items to be verified are execution of stream and seep/spring buffers, snag guides, and road closures.
2. Once awarded, Contracting Officers and their representatives would monitor the timber sale or service contract(s) to assure contract compliance and to assure that design features are being carried out and that they are effective.
3. Regeneration quantity and quality will be monitored to ensure that adequate stocking of desirable species occurs within five years of the execution of the timber sale contract.
4. The wildlife clearing and strips would be monitored to ensure they are providing the desired habitat for wildlife.
5. Post sale monitoring by the forest management staff to review effectiveness of layout, marking, sale administration etc. . . in meeting the objectives of the silvicultural prescriptions will occur within two years of sale closure.

Chapter 3: Affected Environment and Environmental Consequences

- **3.1 Introduction**
- **3.2 Cumulative Activities Summary**
- **3.3 Ecological Components**
- **3.4 Social Components**
- **3.5 Economic Components**
- **3.6 Climatological Factors**
- **3.7 Findings Required by Regulations and other Laws**

3.1 Introduction

This chapter describes the Wells Branch Project Area affected environment as well as the direct, indirect, and cumulative effects of carrying out the proposed or alternative actions. These effects can be either adverse or beneficial. The area of potential effects varies by resource, but it can generally be considered to incorporate the 710 acres in compartment 2094, 1030 acres in compartment 2090, and 1120 acres in compartment 2088, 610 acres in 2089 and 250 acres in2082 (approximately 3720 acres) unless otherwise specified.

The effects analysis for each resource follows a specific format. The format is as follows:

1. Summary of the past, present, and reasonably foreseeable future activities that occur in or have an influence on project area resources.
2. Issues related to a given resource are then presented, followed by the scope of the analysis.
3. The existing resource condition of the affected environment and a discussion of the desired resource condition follow.
4. A discussion of the direct, indirect, and cumulative environmental effects of the specific actions of alternatives will be presented as they relate to the issues identified during scoping.

3.2 Cumulative Activities Summary

The following discussion provides a summary of the known past, present and reasonably foreseeable future activities in the Wells Branch Project Area. This discussion focuses mainly on activities on National Forest lands, but also includes information on private land.

3.2.1 Historic National Forest Management Following Federal Purchase

The land in and around the project area was purchased from several landowners in 1936 and in 1950. At the time of purchase, most lands in the area had been cut-over and contained mainly seedlings/saplings/and some small sawtimber. All low and high quality sawtimber had been removed in previous years. Since most stands were 0-30 years old at the time of purchase it makes sense that today most of the stands are 70 - 100 years old.

3.2.2 National Forest Management 1970 to Present and Future

The project area remained relatively untouched from the time of purchase until the 1970's. Lake Keokee was constructed in the mid 1970's and opened to the public in 1977. Fire suppression has been a perennial management activity. In the 1980's existing roads were maintained and improved and some timber harvesting began to take place.

Harvesting was completed with ground-based (tractor or rubber-tired skidders). Since 1970, regeneration harvest has occurred on approximately 300 acres within the project area. Table 6 displays past timber harvest activities in the Wells Branch Project area.

When timber harvest occurred around the turn of the century, roads were constructed to remove the products harvested. Many of these roads were located in the drains and are no longer used. Since the 1970's, when the Forest Service began implementing significant management activities in this project area, approximately 6 miles of roads have been constructed. These roads are gated year-round.

Several small wildfires have burned in the project area over the last 20 to 30 years. The District has also implemented two prescribed burns on approximately 1155 acres of the project area. These areas have now been burned twice (in the past 6 years) and are exhibiting positive effects. An additional burn of 36 acres has been implemented around the dam on Lake Keokee. Within areas planned for harvest, the fire generally had flame lengths less than an average of 4 feet, or a cool burn.

Table 6: Approximate Past Timber Harvest acreage in the Wells Branch Project Area

Period	Acres	Yarding Method / Harvest Type
1870 – 1920	4000	Ground / Regeneration
1920 – 1975	200-400	Ground Based Thinning And Regeneration
1975 – 1995	300	Regeneration (Ground based) And Ground Based Thinning
1996 – present	0	N/A

Lands/Special Uses/Mineral Rights

There are currently no active gas wells in the project area. All minerals in the area are outstanding or reserved. There is no current activity for mineral access. The dam on Lake Keokee is operated by the Virginia Department of Game and Inland Fisheries (VDGIF) under permit.

Recreation Activities

Hunting, Fishing, and Day Hiking are the most popular recreation activities in the project area. Other forms of dispersed recreation such as backpacking, horseback riding, and bird watching also occur to a lesser extent. All-terrain vehicle (ATV) use has been a popular prohibited activity in the area. There is a developed recreation area (Keokee boat ramp and picnic area) and developed trails. The Stone Mountain Trail, Keokee loop trail, and the connector trail between the two all lay within or partially within the Wells Branch Project Area. Other than the lake there are no other fishable waters on public land in the project area.

Private Lands

The Wells Branch project area is in the headwaters of the Laurel Fork drainage, which is a tributary to the Powell River. A small private parcel is located just west of the dam on Lake Keokee and adjacent to proposed timber sale units. This private parcel contains a mix of old fields, an old mine, and woodland. The other private land adjacent to the project area is generally cleared fields or overgrown fields of varying ages less than 30 years. The houses in the community of Keokee have yards and are generally surrounded by fields, old fields, and woodlands. Much of the rest of the surrounding area is owned by the railroad or coal companies and has been cutover and/or mined for coal.

Future Actions
Maintenance of existing State roads is likely to continue as well as the maintenance of newly created wildlife openings, fire suppression, and prescribed burning. Coal mining on adjacent private land is also likely to continue. Other than these activities, no new activities are planned in the project area foreseeable future.

3.3 Ecological Components

Both physical and biological components enable a diverse ecological community of plants and animals to exist in this area. A basic ecological principle related to ecosystem management is to "care for the land" by protecting or restoring the integrity of its air, soil, water, biological diversity and ecological processes. The components discussed in this section relate primarily to those physical and biological entities that make up the area ecology.

3.3.1 Hydrology

Significant Issue(s) Related to this Resource:

1. Effects of Harvesting, Roadwork, and Associated Projects on Water Quality and Riparian Areas.
2. Effects of Harvesting, Roadwork, and Associated Projects on TES habitat.

Scope of the Analysis:

For Alternative 1, the scope of the analysis for determining the effects on hydrologic resources includes the following watersheds in the North Fork of the Powell River: Wells Branch, a tributary of Craborchard Creek, and the North Fork of the Powell River above its confluence with Craborchard Creek. The remaining watershed is Laurel Fork; which is in the South Fork of the Powell River watershed.

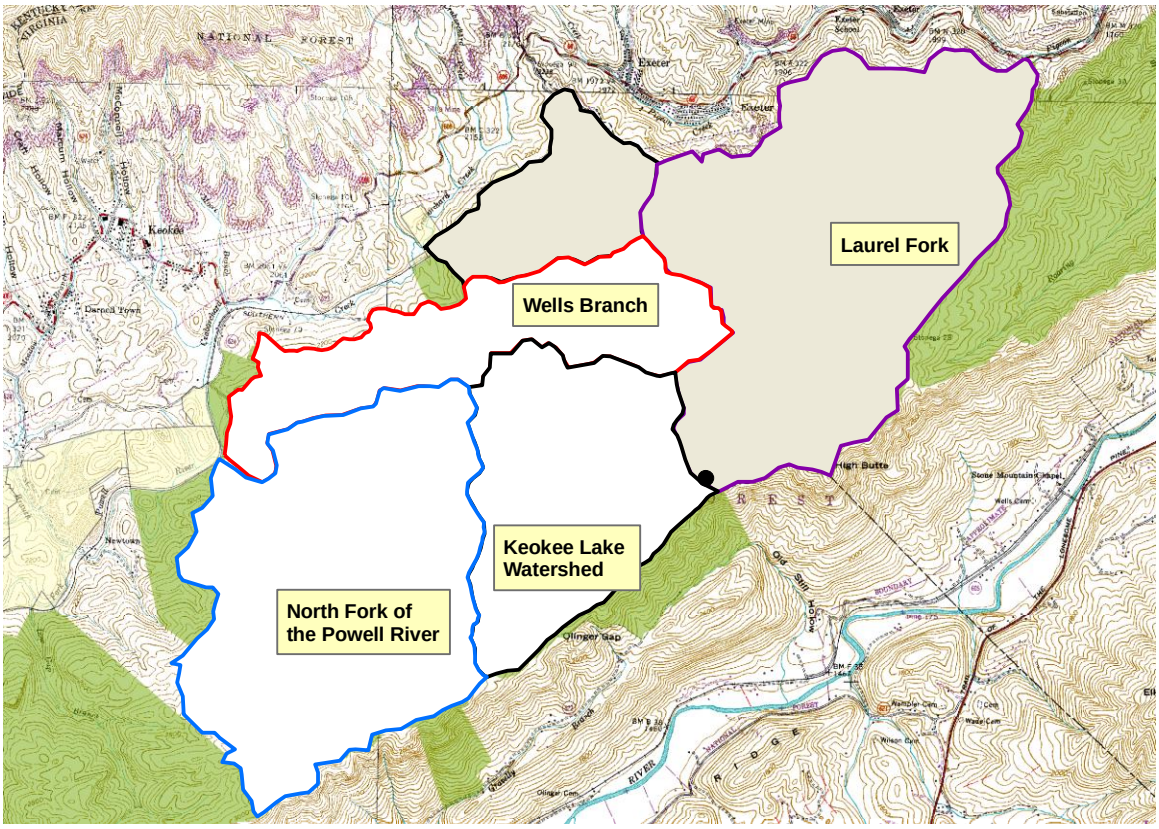


Figure 2. Project Area Watersheds

<u>Existing Condition</u>:

Wells Branch, Craborchard Creek, and the headwaters of the North Fork of the Powell River are subwatersheds of the Reeds Creek [6th level hydrologic unit code (HUC) 060102060202]; a subwatershed of the North Fork of the Powell River. Laurel Fork is a subwatershed of Pigeon Creek (6th level HUC 060102060104); a subwatershed of the South Fork of the Powell River. The watershed area and annual background sediment production of these watersheds is given in Table 6. Annual precipitation over the project area averages 50 to 54 inches. The majority of the watersheds are in forested land cover; the exception being Craborchard Creek. The private portion of Craborchard Creek was clearcut approximately 8 years ago and is currently in an early successional growth stage with numerous unvegetated roads and log landings spread throughout the watershed.

Table 6. Watershed Area and Annual Background Sediment for the Project Area Watersheds

Watershed	Watershed Area (acres)	Annual Background Sediment (tons)
Craborchard Creek	1251	197.7
Wells Branch	830	61.4
Roberts Hollow	2286	361.2
Laurel Fork	1635	258.3

Past and present actions that have affected the existing situation in the Wells Branch Cumulative Effects Analysis Area -

Timber harvest has occurred several different times in the past in the project area. All BMP's were followed during the recent harvests of these stands. Sedimentation from past timber harvest on public lands would have returned to near background levels after approximately 4 years. The exceptions to this are the areas that are experiencing illegal ATV traffic. Illegal ATV traffic is the past and present activity causing the majority of the sedimentation occurring in the Project Area. Impacts from illegal ATV traffic are discussed in the cumulative effects discussion below.

The general watershed condition of Craborchard Creek on private lands would be considered "Fair," largely due to the amount of logging infrastructure on private lands in the watershed that did not properly re-vegetate after the commercial timber harvest. On public lands, the watershed condition is good, the only impacts being those from the illegal ATV use.

The general watershed condition of Laurel Fork on private lands would be considered "Fair," largely due to the amount of logging infrastructure in the watershed that did not properly revegetate after the commercial timber harvest. A deep coal mine (subsurface mining) is also in the watershed. On public lands, the watershed condition is in excellent condition.

The watershed conditions of all the other project area streams are good, the only impacts being those from illegal ATV use.

Effects from Past and Present Illegal ATV Use

Parts of the project area have been heavily utilized by illegal ATV riders over the past several years. Multiple attempts by Forest Service law enforcement officers to curtail this activity have proven largely fruitless. These groups have even blazed their own trails and built cabins on public land in the area. Because of this use, system roads, system trails, and old state roads are being ridden in the project area and are causing sediment impacts to streams in the area. Sediment analysis was conducted to capture the impact of these illegal activities to accurately characterize the existing condition of the watersheds. Documentation of the method used to estimate the sediment produced by these illegal activities is provided below in the "Direct, Indirect, and Cumulative Effects" section below. Table 7 illustrates the sedimentation by watershed as a result of these illegal activities.

Table 7. Sediment Produced by Illegal ATV Traffic in the Project Area.

Stream	Total Sediment Produced from ATV's	Normal Background Sediment	% of Normal Background
North Fork of the Powell	4.03	361.19	1.11
Keokee Lake	3.58	61.42	5.83
Wells Branch	3.61	49.06	7.35
Craborchard Creek Tributary	0.02	197.66	0.01
Laurel Fork	0.2	258.33	0.08

Future Foreseeable Actions

No known activities are planned on private property in the project area and no activities are anticipated on public lands that should affect potential for sedimentation other than those outlined in this EA.

STREAM CHEMISTRY AND HEALTH

Powell River

The Powell River at its confluence with Pigeon Creek is identified in the Forest Plan as a Priority Watershed, having a below-average Watershed Condition Ranking (WCR) (Forest Plan 2-3). The following discussion from the Final Environmental Impact Statement (FEIS) of the Forest Plan (FEIS 3-36) explains the assignment of a WCR of "below average" as follows:

> *The watershed includes stream reaches that have been identified as impaired and are included on Virginia's 303d list, and the Clinch and Powell Valley Watershed Ecological Risk Assessment (US EPA, 2002) identifies sediment as a stressor affecting native mussels and native fish in this watershed. Based on the weight of evidence, the Powell River watershed has been assigned a modified WCR of "below average" (BA).*

As sediment has been identified as the main stressor (most likely due to surface mining, which is prevalent in the watershed at and above Appalachia) effects to the WCR status of the South Fork of the Powell River will be discussed in the "Cumulative Effects" section below.

Water Quality

Water samples have been taken annually in the project area. All streams exhibit good water quality (see following table). The results from the water quality monitoring are typical of the majority of the Clinch Ranger District streams, with lower pH and buffering capacities due to the carbonate-poor nature of the geology underbedding the area.

Table 8. Stream Chemistry Data for the Project Area Streams*

Stream	Sample Year	pH	ANC	Na	K	Mg	Ca	Cl	NO3	SO4	Al	Ca/H
Wells Branch	2007	5.77	11.34	0.4	0.5	0.7	0.8	0.4	0.0		3.8	11.3
	2006	8.73	11384.3	11.5	84.3	513.8	930.0	1342.0	23.9	3031.0	36	499440
	2005	6.16	44.0	17.8	14	52.1	44.2	13.0	2	77.9	13	30.6
	2004	6.07	19.7	11.6	19.4	53.5	38.9	12.7	1.4	84.8	0	33.1
	2003	5.97	11.0	17.2	10.1	56.9	54.1	12.6	2.3	96.5	0.0	50.5
	2002	6.58	31.9	15.3	12.6	49.9	54.2	14.7	2.5	72.8	ND	206.1
	2001	6.25	48.8	22.4	10.7	58.4	52.7	15.4	4.7	72.7	11	93.7
Laurel Fork	2011	6.20	23.3	25.4	11.3	80.1	53.0	12.6	0.6	77.5	6.0	
	2010	6.22	20.8	23.0	11.8	93.0	50.2	12.0	0.5	80.4	11.0	
	2009	5.68	6.1	18.4	9.7	64.8	44.0	13.0	0.2	77.2	11.0	
	2007	6.5	48.0	1.4	0.8	2.0	3.1	0.7	0.2		14.9	48.0
	2005	6.2	15.9	19.7	12.4	50.8	28.7	13.7	0.8	77.8	0.0	20.3
	2004	6.2	15.5	12.2	21.3	53.7	30.2	12.2	0.3	81.3	0.0	19.1
	2003	6.0	10.2	20.7	11.1	52.8	28.6	14.0	2.2	84.7	0.0	29.3
	2002	6.1	10.2	16.3	11.5	51.4	34.4	15.5	1.6	81.9	12.0	46.4
	2001	6.3	39.4	27.7	9.4	52.4	35.0	16.1	2.3	71.2	17.0	63.7
N F Powell	2005	6.32	31.8	15.7	17.1	48.2	59.3	14.3	1.4	69.3	82	28.4
	2004	6.80	222.1	10.6	12.8	92.7	22.5	10	4.7	123.4	0	3.56
	2003	6.61	179.1	13.7	11.3	95.8	167	13	3.4	152.9	0	680.3
	2002	6.86	56.0	14.2	18.5	47.1	79.3	13.5	1.7	58.6	ND	574.5
	2001	6.42	76.7	20.9	13.9	48.6	58.9	14.3	3.1	63.1	9	154.9
Roberts Hollow Trib	2005	5.86	8.6	13.7	8.9	46	33.6	11.2	2.5	74.2	11	46.38
	2004	5.87	13.5	14.2	11.4	46	30.3	13.3	1.2	74.4	0	40.87
	2003	5.55	1.2	12.8	10	45	38.1	12.1	3.9	84.7	10.56	13.52
	2002	6.17	8.2	14	11.9	48.2	48.8	13.8	3.3	75.1	18	72.18
	2001	6.11	15.6	16.2	7.7	46.2	31.8	14.5	4.2	65.5	10	40.97

*All units are µeq/l, except pH (no units) and Al (ppb).

Stream Habitat

Craborchard Creek Tributary

Craborchard Creek does not exist as a surface feature on National Forest lands. A portion of the project area drains into the stream; which flows west toward a confluence with Wells Branch. On the private portion of the watershed, stream segments on the higher gradient slopes exhibit streambeds embedded with sand and silt due to the disturbance history of the watershed; which includes strip mining and large-scale industrial clearcutting. As the stream flows west and the gradient decreases, the channel is dominated by a complex of beaver meadows.

Wells Branch

Wells Branch was surveyed in 1999 by stream interns Wes Childress and Brandon Sluss (now a biological technician on the District). The stream was sampled for approximately a mile and a half, with habitat consisting of 42% riffle, 27% pool, and 30% glide. The dominant substrate (90%) was sand/silt with gravel as the secondary substrate (10%). Embeddedness was high throughout the reach, but this is to be expected with the low gradients (1-2%) through most of the surveyed area, which limit the transport of fine sediments. Sand is a natural component in streams in this area; due to the sandstone that underbeds the streams and the low gradients of the stream channels.

Today, the stream is much the same, with a flat, sandy channel. The main difference is that beavers have constructed dams across the lower parts of the drainage, forming meadows in the western portions of the project area. As time progresses, beavers should continue to recolonize all the low gradient portions of the drainage, forming extensive meadows that were most likely the norm for this stream before beavers were extirpated.

Laurel Fork

The portion of Laurel Fork that occurs on the National Forest was also surveyed in 1999 by Wes Childress and Brandon Sluss. The stream was sampled for approximately 2.3 miles on the National Forest with habitat consisting of 55% riffle, 18% pool, and 28% glide. The dominant substrate was sand/silt (80%) with gravel (12%), cobble (5%), and bedrock (2%) forming the remainder. Finer substrates and glides were more prevalent in the upper reaches of the stream where gradients were lower, while riffles and pools were more prevalent in the higher gradient reaches in the eastern part of the project area.

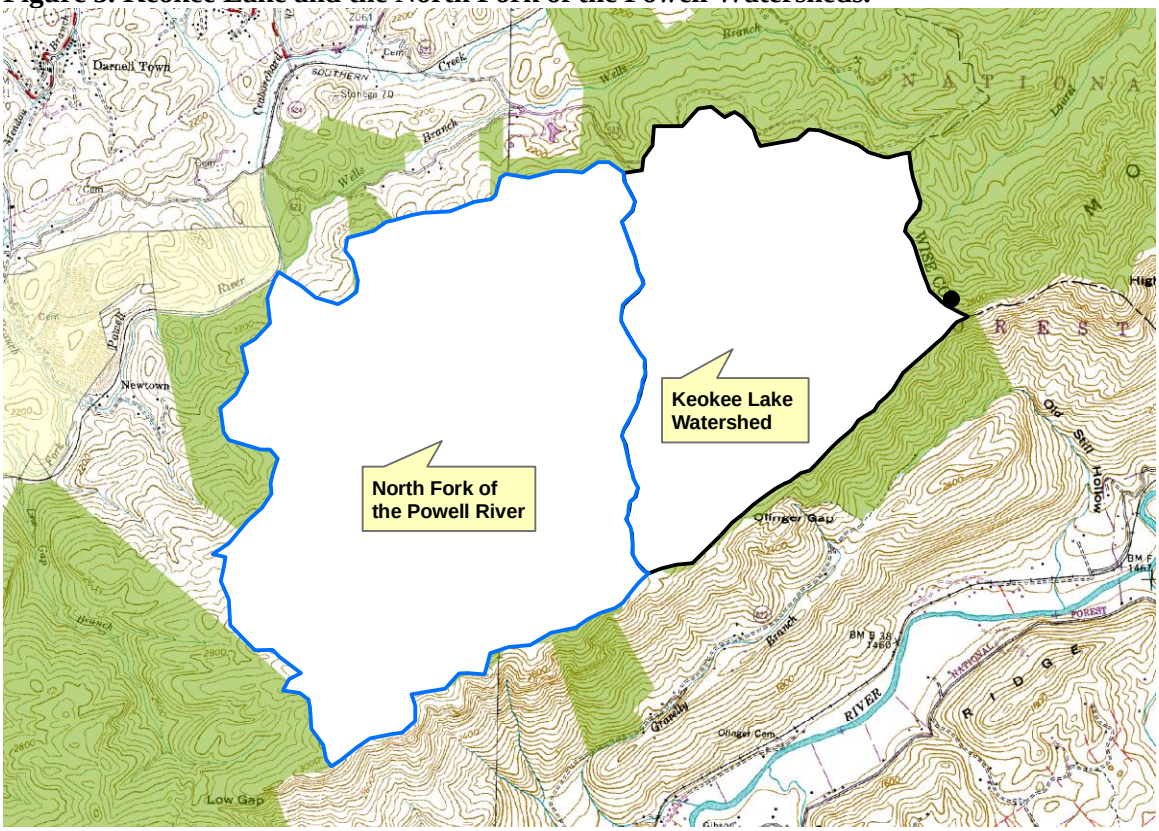
Today the stream is essentially unchanged on the National Forest. There is a possibility that beavers will recolonize parts of the stream in the project area, due to the low gradients and the presence of beavers downstream on private property; but as of the writing of this EA, there was no beaver activity on the National Forest. Overall, the stream habitat is healthy with no impaired reaches.

Low gradient reaches of the stream on private property are impounded by beavers with meadows in various stages of evolution. The higher gradient reaches are similar to the riffle/pool reaches on the National Forest, but with a higher prevalence of fine sediments due to the mining and commercial clearcutting that has occurred in the watershed.

North Fork of the Powell

For purposes of this analysis, the North Fork of the Powell (which includes Keokee Lake) will be divided for individual discussion and then combined for the final determination of effects. The discussion will be divided as: Keokee Lake and the tributaries that drain into it, and then the North Fork of the Powell as the drainage area below the lake (see Figure 3 below).

Figure 3. Keokee Lake and the North Fork of the Powell Watersheds.

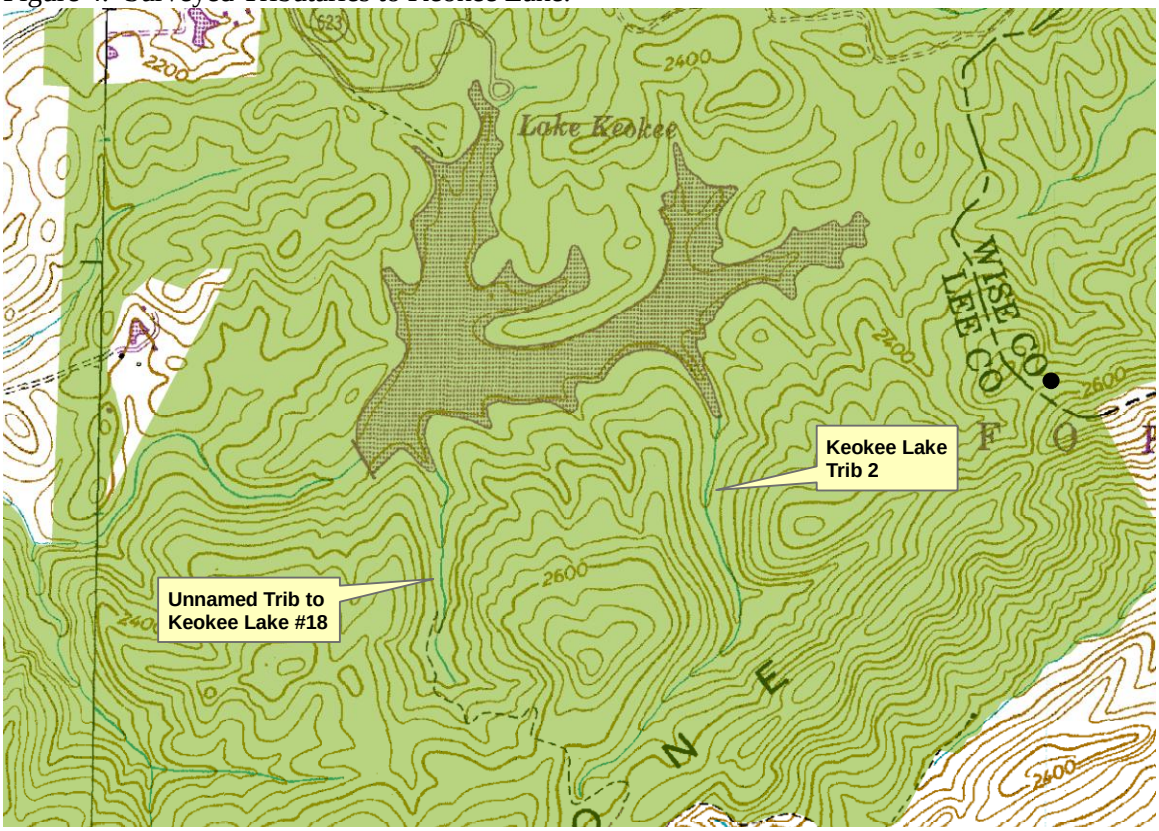


Keokee Lake

Two tributaries of Keokee Lake were surveyed in 1998 and 1999: one named Keokee Lake Tributary 2 surveyed by Misty Moore and Tom Hensley, stream interns; and one named unnamed tributary to Keokee Lake #18 surveyed by Angela Dean and Chris Owens, stream interns (see figure 4 below).

During those summers, both streams were dry with channels dominated by sand. At base flow, both streams are watered for a significant portion of their reaches. Keokee Tributary 18 now has a beaver meadow at about 2400 feet elevation. Both streams have sand beds with gravel, cobble, and some bedrock intermixed. All the drainages that empty into Keokee Lake have slack, low gradient channels primarily bedded with sand. This is a natural state for very flat streams in areas with sandstone geology.

Figure 4. Surveyed Tributaries to Keokee Lake.



The North Fork of the Powell River

A short section of the North Fork of the Powell was surveyed by Misty Moore and Tom Hensley in August of 1998. Approximately 0.4 miles were surveyed (of which 75% was watered) in the area immediately downstream of Keokee Lake on the National Forest. The habitat consisted of 55% riffle, 23% dry channel, and 23% glide. The dominant substrate was cobble (43%) with sand (29%), small boulder (14%), and bedrock (14%) forming the remainder. The substrate in this reach is considerably coarser when compared with upstream reaches and comparable reaches in adjacent watersheds, due to retention of sediment in Keokee Lake.

The lower reaches of the river, near its confluence with Craborchard Creek are more typical of the streams in the area. The channels are very low gradient, with primarily a sand substrate. The lower half mile of the stream is a complex of beaver dams, with unimpounded areas consisting of slack channels that are downcutting through relic beaver meadows.

<u>Sedimentation</u>

Virginia State Code 9VAC25-260-20 states that:

> *State waters, including wetlands, shall be free from substances attributable to sewage, industrial waste, or other waste in concentrations, amounts, or combinations which contravene established standards or interfere directly or indirectly with designated uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life.*
>
> *Specific substances to be controlled include, but are not limited to: floating debris, oil, scum, and other floating materials; toxic substances (including those which bioaccumulate); substances that*

produce color, tastes, turbidity, odors, or settle to form sludge deposits; and substances which nourish undesirable or nuisance aquatic plant life.

Sediment can cause turbidity, and is therefore subject to this standard. In addition, Virginia's antidegradation policy (9VAC25-260-30) applies to this area. That policy says that actions may not interfere with or become injurious to existing beneficial uses unless the State Water Control Board determines that such action is socially or economically justified.

Sediment is also subject to the nonpoint source pollution regulations for Virginia. These regulations require the voluntary application of Best Management Practices (BMP's) to control sedimentation during timber management activities. The Virginia Department of Forestry's handbook of BMP's for forestry (revised 2002) lists the "voluntary" BMP's. Standard 206 of the Forest Plan requires the use of the Virginia BMP's, and the Forest Plan lists specific BMP's to provide additional resource protection. Finally, standards set by the "Federally Listed Endangered and Threatened Mussel and Fish Conservation Plan" developed for the Jefferson National Forest in consultation with the US Fish and Wildlife Service, were incorporated into the Jefferson National Forest Land and Resource Management Plan. These standards provide additional protections to prevent sediment impacts to downstream Threatened and Endangered mussel and fish species.

All Forest Plan standards meet or exceed the Virginia BMP's for forestry activities. The Forest has initiated a monitoring program to evaluate the effectiveness of the standards. The result of this program will be a feedback process to continually adjust standards as needed to improve effectiveness.

The Virginia Department of Forestry conducted water quality monitoring in association with timber harvests from 1989 to 1996 (Va. Dept. of Forestry, 1998). At sites in the mountains, Piedmont, and coastal plain, water temperatures were taken at 10-minute intervals, and water samples were collected automatically before, during, and after storm events, both upstream and downstream from logging. Aquatic macroinvertebrates were also sampled periodically. This monitoring showed that, when forestry BMP's are properly implemented, timber harvests can be accomplished without a large or persistent increase in sediment, an increase in stream water temperatures, or a shift in macroinvertebrate species composition.

Direct and Indirect Effects:

Sedimentation

Some sediment occurs naturally in all stream systems and is part of the natural geologic processes. Natural watershed disturbance regimes of fire, flood, insect, and disease result in a range of natural variability of sediment to which the stream channel has adjusted. However, human caused soil disturbing activity such as road construction activities, log landings, skid roads, and skid trails can produce volumes and rates of sediment delivery to streams that are in excess of the stream's ability to accommodate it. Excess sediment in streams can coat the stream bottom, fill pools, and reduce the carrying capacity of the stream for fish and stream insects. Fine sediment can fill the voids between gravel particles in the streambed, reducing the movement of aquatic insects, water and oxygen. The effects of sediment delivered to a stream channel diminish as watershed size increases. Most vulnerable are small sensitive headwaters catchments where concentrated timber harvest activity can have profound results.

In reality, there is a great deal of variability of a watershed's sediment yield between years (interannual variability). Sediment yield is much greater during high runoff years with more stormflow to erode and transport sediment. Conversely, sediment yield is much less during drought years when high flows may be less than bankful. Data from the USGS gage on the Powell River at Speers Ferry provides an expression of the variability of annual sediment yield. For the 62 years with flow and sediment data, each

year's percent difference from the long term mean ranges from + 143 percent to – 100 percent. A change of annual sediment yield of plus or minus 52 percent represents one standard deviation from the long term mean, and values less than 52 percent are interpreted as being within the range of interannual variability.

The effect that naturally occurring forest fires or prescribed burns can have on increased sediment production within a watershed depends on burn intensity. Low intensity burns do not scorch the soil organic layers nor do they burn the roots of existing vegetation, which starts to re-grow during the next growing season. No bare mineral soil is exposed as the result of the burn. Research on wildfire and prescribed burning indicates that low intensity or "cool" burns result in only minor increases in erosion and sedimentation. Beschta (1990) observes that

> *Where organic matter comprising the forest floor is only partially consumed by fire, the effects of fire upon surface erosion processes may be minimal…. Relatively "cool" burns should have little impact on erosion and sedimentation, regardless of general watershed slope.*

This observation from Oregon is supported by similar conclusions from Anderson and others (1976), Douglas and Van Lear (1983), Neary and Currier (1982), and Van Lear et al. (1985). Handline construction for this project will be accomplished using leaf blowers and rakes. Mineral soil will be relatively undisturbed. Accordingly, this activity will have little impact on erosion and sedimentation.

A sediment model was used to estimate the tons of sediment produced by each road, landing, or excavated skid trail, and delivered to respective stream channels. The modeling approach is largely based on the USDA Forest Service "Guide for Predicting Sediment Yield from Forested Watersheds" (1981). This guide tiers to another procedural guide 'An Approach to Water Resources Evaluation of Non-Point Silvicultural Sources' and abbreviated as WRENSS (1980). The procedure assumes a basic road erosion rate as determined from research data from North Carolina and West Virginia (Swift, 1984; Kochenderfer and Helvey, 1984). The research data expresses the tons per acre moved from the road during the first year after construction. This unit rate is multiplied by the disturbed area in acres to obtain unmitigated road erosion in tons. This figure is then adjusted for factors of geology and soils, road gradient, and mitigation to obtain an adjusted value of total road erosion. Total road erosion is then delivered to the stream channels based on aggregated sediment delivery ratios from the WRENSS document. The sediment delivery ratio for each road segment is calculated using factors based on sideslope, soil texture, and distance from the road to the nearest channel or drainway, and also factors of surface roughness, slope position, percent ground cover, and slope shape. These combined factors are translated into a Sediment Delivery Index that represents the portion of eroded material that is actually delivered to a stream. When multiplied by road segment, landing, skid trail, and prescribed burn fire line erosion, it gives an estimate of tons of sediment delivered to the adjacent stream channel at the time of the soil disturbing activity (first year). This sediment increase is compared with existing annual sediment yield from each watershed as determined by data from Patric, Evans, and Helvey (1984) and displayed as a percent increase over existing.

Rates of soil erosion and sedimentation are greatest at the time of soil disturbing activity and decrease as the soil stabilizes and vegetation begins to grow. Second year sediment rates are estimated to be only 35 percent of first year rates. After four years, sediment rates have usually returned to pre-disturbance levels.

Sediment modeling is based on a number of assumptions that may not be accurately reflected on the ground. The results provide very rough approximations of the changes in sediment delivery that might be expected as a result of proposed activities. Nevertheless, they allow a comparison of the impacts of various alternatives and provide a measure of relative risk to the aquatic ecosystem. The model assumes that Forest Plan standards and guidelines as well as Virginia Best Management Practices for Forestry will be implemented. It also assumes that all the proposed management activities will take place in the same

year; which will not occur; therefore, actual levels of sediment reaching the receiving streams will likely be lower, but will not be higher. This insures that Critical Habitat downstream in the Powell River will be protected. The model assumes a "normal" runoff and sediment year.

Sediment Effects from the Action Alternative

For Alternative 1, pre-haul maintenance of system roads, landing construction and new temporary and bladed skid road construction could cause sediment effects to the watersheds listed above. Table 9 below displays the results of the sediment model by watershed, both in tons of sediment from the activity and in percent increase over background sediment production from the watersheds.

Table 9. First Year Sediment Production from Soil Disturbing Activities in the Wells Branch Vegetation Management Project

Watershed	Tons from Timber Activities	Normal Background Sediment	Percent Increase Over Background
North Fork of the Powell River	5.40	361.19	1.50
Keokee Lake	5.86	61.42	9.55
Wells Branch	7.35	49.06	14.98
Crab Orchard Tributary	1.39	197.66	0.70
Laurel Fork	4.419	258.33	1.71

* Includes portion that exits Keokee Lake (see explanation below).

North Fork of the Powell River and Keokee Lake

Keokee Lake

Direct Effects

Sediment modeling predicted that about 9.6 tons of sediment produced by management actions would make its way into Keokee Lake. Once sediment enters a still body of water, such as a lake, the coarse sediments almost immediately drop out and are retained; especially in a lake like Keokee where the water exits the lake through a standpipe. A portion of the fine sediments may stay suspended long enough to exit the reservoir and be transported downstream.

The sediment trapping efficiency of a reservoir can be calculated from the storage capacity and the annual inflow with a method developed by Brune (1953) and refined by Dendy (1974). The storage capacity was calculated by multiplying the surface area of the lake in acres by the mean depth. The numbers supplied by the Virginia Department of Game and Inland Fisheries in their online description of Keokee Lake (92 acres and 17 feet) were used for this calculation (http://www.dgif.virginia.gov/fishing/waterbodies/reports/2010%20Keokee%20Lake%20Bio%20Rpt.pdf). Annual inflow was estimated by back-calculating annual runoff from the stream gage in the North Fork of the Powell River at Jonesville, VA, and then scaling this amount to the drainage area of Keokee Lake. These figures can then be plugged into a formula that generates a trapping efficiency for a given reservoir. In this case, the trap efficiency of Keokee Lake was found to be 97.2%. Therefore, 2.8 % of the predicted sediment total was added to the North Fork of the Powell River total and used to discuss effects to that watershed.

The effects from the remainder can be discussed as a reduction in lake volume. This is a simple calculation based on the data developed for the trap efficiency calculation above. The lake capacity is converted from acre-feet to cubic yards (multiply by 1613.33) and then cubic yards of sediment are calculated (divide tons by 1.35). Then, it is a simple percent calculation, which in this case turns out to be

less than 0.0002% - a negligible reduction in lake volume. There will be no direct effect to Keokee Lake from implementing the proposed action.

Indirect Effects

Indirect effects possible from the proposed action that could affect sedimentation would be an increase in illegal ATV use from the new logging roads in the proposed management action. This EA incorporates a design feature that would require the new skid roads created by the project to be filled with logging slash to prevent them from being ridden by illegal ATV's and monitoring to insure the effectiveness of this feature would be required; therefore, there should be no indirect effects from the proposed action.

North Fork of the Powell River

Direct Effects

As discussed in the habitat description above, the reaches of the North Fork of the Powell River below Keokee Lake are considerably coarser than neighboring drainages. This is likely due to sediment starvation due to capture by Keokee Lake; which has a drainage area of 830 acres (about 36% of the total drainage area of the North Fork of the Powell watershed) and is very effective at trapping sediment, as seen in the discussion above.

Sediment analysis revealed a 1.5% increase in sediment production from the proposed action. With the design features mentioned below, the effects from the proposed actions should decrease over time, returning to near background levels within five years of the completion of the project. There would be no change in the stream bed composition or in aquatic habitat quality or complexity from sediment related to the project.

There should be no measurable direct effect to the North Fork of the Powell River or its tributaries in the project area, or to any reaches downstream.

Indirect Effects

Indirect effects possible from the proposed action that could affect sedimentation would be an increase in illegal ATV use from the new logging roads in the proposed management action. This EA incorporates a design feature that would require the new skid roads created by the project to be filled with logging slash to prevent them from being ridden by illegal ATV's and monitoring to insure the effectiveness of this feature would be required; therefore, there should be no indirect effects from the proposed action.

Wells Branch

Direct Effects

Wells Branch had a predicted sediment increase over background levels of about 15%. Much of the sediment produced by the proposed action will drop out and be retained behind the beaverdams in the lower part of the watershed. With the slash design features mentioned below, the effects from the proposed actions should decrease over time, returning to near background levels within five years of the completion of the project. There will be no change in the stream bed composition or in aquatic habitat quality or complexity from sediment related to the project.

There should be no measurable direct effect to Wells Branch or its tributaries in the project area, or to any reaches downstream.

Indirect Effects

Indirect effects possible from the proposed action that could affect sedimentation would be an increase in illegal ATV use from the new logging roads in the proposed management action. This EA incorporates a design feature that would require the new skid roads created by the project to be filled with logging slash

to prevent them from being ridden by illegal ATV's and monitoring to insure the effectiveness of this feature would be required; therefore, there should be no indirect effects from the proposed action.

Craborchard Tributary

Direct Effects

Sediment analysis revealed an approximate 0.7% increase in sediment production from the proposed action. With the design features mentioned previously, the effects from the proposed actions should decrease over time, returning to near background levels within five years of the completion of the project. There will be no change in the stream bed composition or in aquatic habitat quality or complexity from sediment related to the project.

There should be no measurable or observable direct effect to the Craborchard Tributary in the project area, or to any reaches downstream.

Indirect Effects

Indirect effects possible from the proposed action that could affect sedimentation would be an increase in illegal ATV use from the new logging roads in the proposed management action. This EA incorporates a design feature that would require the new skid roads created by the project to be filled with logging slash to prevent them from being ridden by illegal ATV's and monitoring to insure the effectiveness of this feature would be required; therefore, there should be no indirect effects from the proposed action.

Laurel Fork

Direct Effects

Sediment analysis revealed an approximate 1.7% increase in sediment production from the proposed action. With the design features mentioned previously, the effects from the proposed actions should decrease over time, returning to near background levels within five years of the completion of the project. There would be no change in the stream bed composition or in aquatic habitat quality or complexity from sediment related to the project.

There should be no measurable or observable direct, indirect, or cumulative effects Laurel Fork or its tributaries in the project area, or to any reaches downstream.

Indirect Effects

Indirect effects possible from the proposed action that could affect sedimentation would be an increase in illegal ATV use from the new logging roads in the proposed management action. This EA incorporates a design feature that would require the new skid roads created by the project to be filled with logging slash to prevent them from being ridden by illegal ATV's and monitoring to insure the effectiveness of this feature would be required; therefore, there should be no indirect effects from the proposed action.

Cumulative Effects

North Fork of the Powell River and Keokee Lake

As has been previously stated, the upper reaches of the North Fork of the Powell are sediment starved as a result of the efficient sediment trapping of Keokee Lake. The lower reaches are in excellent condition, with typical channels and stream habitats. The streams that drain into Keokee Lake are in good condition, with typical stream habitats and substrates for their stream types. The lake itself shows no effect from any past sedimentation. The persistent illegal ATV use is relatively light in this watershed, and there has been no detectable degradation in stream or lake habitat from the increased sediment. It is very likely that the watershed has adjusted to the slightly higher sediment loads and is at equilibrium, forming a new background sediment level. The projected sediment totals, coupled with the background use of the area

that is likely to persist are well within background levels. There will be no cumulative effect to water quality, riparian areas, or any TES habitat from implementing the proposed action.

Wells Branch

The available stream habitat in Wells Branch is in good condition. The amount of free-flowing stream channel habitat decreases each year as the influence of beavers spreads upstream. It is likely, short of extirpation through trapping, that most of the watershed will eventually become a large beaver meadow. This would be the desired future condition for this watershed.

Because the streams still have acceptable habitat, it is likely that the sediment from the persistent illegal ATV traffic has become incorporated as a modified background sediment level for this watershed. The natural substrate for much of this watershed would naturally be sand, due to the low gradient and parent geology. Excessive sediment in the system should express itself as overloaded, braided channels. This is not the present state of the watershed. The projected sediment levels coupled with the amount of sediment computed for the illegal ATV use are within background levels for this system. As the effects from the proposed action fade into the background, the watershed will return to its current, modified background sediment level. There will be no cumulative effect to water quality, riparian areas, or any TES habitat from implementing the proposed action.

Crab Orchard Tributary

As mentioned above, the Crab Orchard Tributary does not exist as a surface feature on the National Forest. The projected sediment levels anticipated from the project, coupled with the estimates of the effects from past and present illegal use, are less than 1% of the background sediment level for this system. With the design features in place, there should be no cumulative effect to water quality, riparian areas, or any TES habitat from implementing the proposed action.

Laurel Fork

Projected sediment levels from the proposed action coupled with the estimates of the effects of illegal ATV use represent about a 2.5% increase over background levels. With the design features in place, there should be no cumulative effect to water quality, riparian areas, or any TES habitat from implementing the proposed action.

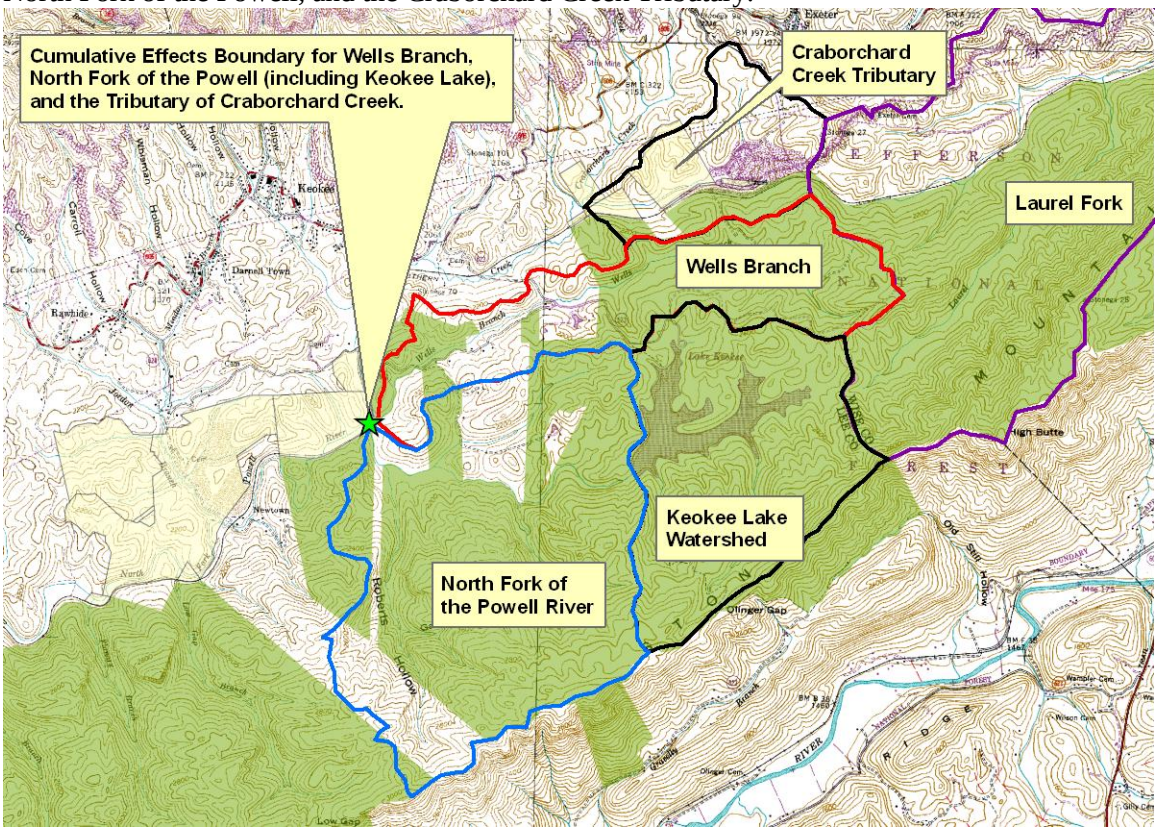
Effects to the WCR status of the South Fork of the Powell River

As mentioned above, the South Fork of the Powell River is identified as a Priority Watershed in the Forest Plan, due to the impacts from sediment in the watershed. Some portion of the sediment transported downstream from Laurel Fork would eventually make its way to the South Fork of the Powell River. However, in the context of the larger watershed, the cumulative sediment generated project area represents 0.005% of the natural background sediment of a watershed the size of the South Fork of the Powell at Appalachia. The background sediment of this watershed is likely orders of magnitude higher due to the land use history of the watershed. There will be no cumulative negative effect to the Priority Watershed from the proposed action.

Cumulative Effects Boundary for Effects to Project Area and Downstream Aquatic Organisms

Because the streams in the project area flow in two different directions and empty into widely separated river systems, multiple cumulative effects boundaries will need to be set for this project. For effects from the management actions planned in the Wells Branch, North Fork of the Powell, and the Craborchard Creek Tributary, the Cumulative Effects Boundary is set as the confluence of the North Fork of the Powell River with Craborchard Creek (see Figure 5).

Figure 5. Cumulative Effects Boundary set for the Management Actions Planned in the Wells Branch, North Fork of the Powell, and the Craborchard Creek Tributary.



For the management actions planned in Laurel Fork, the Cumulative Effects Boundary is set as the confluence of Laurel Fork with Pigeon Creek. Beyond these two points, the effects are immeasurable and indistinguishable from background levels.

3.3.2 FISHERIES AND AQUATIC HABITAT

This section of the environmental effects analysis discusses different aspects of aquatic habitat elements. For the purpose of this discussion, the term "aquatic" refers to fish and other water-dwelling wild animals that could occur in the proposed project area.

The issue considered in detail in this section is the effects of commercial and pre-commercial harvesting, roadwork, herbicide treatments, prescribed burning and associated projects on water quality and downstream TES species.

Scope of the Analysis:
The scope of the analysis for determining the effects on aquatic resources includes:

- the watersheds of Wells Branch; the tributary of Craborchard Creek; and the North Fork of the Powell River (including Lake Keokee) down to the confluence of Craborchard Creek and the North Fork of the Powell River;
- the watershed of Laurel Fork down to its confluence with Pigeon Creek.

The hydrologic analysis determined that effects beyond these points would be immeasurable and indistinguishable from background levels. These points were defined as the Aquatic Analysis Area in the Hydrology section of this EA.

Existing Conditions
A full discussion of the chemical and geomorphic condition of streams in the proposed project area is provided in the Hydrology section of this document.

Fish Communities
Laurel Fork was sampled by Chuck Lane (District Biologist) and Chris Owens (Biological Technician) on May 13, 2003. Three 100-yard sections were sampled on private property, and three sections were sampled on the National Forest. The three private surveyed reaches had the five species listed in Table X. The private reaches of the stream was sampled again on March 15, 2012. This time, representative sections were sampled and the species that were collected are given in Table 10. Similar species were collected, with the differences most likely due to the difference in sampling methods. In both 2003 and 2012, the three sections on the National Forest had only blacknose dace and creek chubs. This is typical of the small order, coldwater streams that drain the National Forest in the area.

Table 10. List of Fish Species Collected in Laurel Fork in 2003.

2003		2012	
Common Name	Scientific Name	Common Name	Scientific Name
blacknose dace	*Rhinichthys atratulus*	blacknose dace	*R. atratulus*
creek chub	*Semotilus atromaculatus*	creek chub	*S. atromaculatus*
white sucker	*Catostomus commersoni*	northern hogsucker	*Hypentelium nigricans*
central stoneroller	*Campostoma anomalum*	central stoneroller	*C. anomalum*
fantail darter	*Etheostoma flabellare*	rock bass	*Ambloplites rupestris*
		fantail darter	*E. flabellare*

The North Fork of the Powell River was sampled by Chuck Lane and Brandon Sluss on July 14, 2011. Table 11 lists the species collected.

Table 11. List of Fish Species Collected in the North Fork of the Powell River.

Common Name	Scientific Name
blacknose dace	*Rhinichthys atratulus*
creek chub	*Semotilus atromaculatus*
striped shiner	*Luxilis chrysocephalus*
northern hogsucker	*Hypentilium nigricans*
green sunfish	*Lepomis cyanellus*

Two 100-yard sections were sampled below a large beaverdam complex. This fish population is typical of slack, warmwater systems. Stream habitat quality and complexity were excellent, and larval, as well as adult specimens were collected.

Both fish communities indicate healthy streams with good complexity for the size of the drainage. The presence of abundant larval fish at both locations indicates that spawning habitat is not impaired in either drainage.

Aquatic Macroinvertebrates

Aquatic macroinvertebrate communities integrate the physical, chemical, and biological components of the riparian ecosystem and have been successfully used as bioindicators to monitor change and impacts (Barbour et al 1999). An analysis of over 500 streams on the George Washington and Jefferson National Forests has established the current range of conditions for aquatic macroinvertebrate communities across the four ecological sections (Blue Ridge Mountain, Northern Ridge and Valley, Cumberland Mountain and Allegheny Mountain Sections) found on the Forest. A Macroinvertebrate Aggregated Index for Streams (MAIS) (ranging from a score of 0 to 18) incorporates nine ecological aspects (metrics) of the aquatic macroinvertebrate community to evaluate the current condition of a stream relative to others within the same ecological section (Smith and Voshell 1997). It also establishes a baseline to evaluate effectiveness of standards, guidelines and mitigation measures in preventing changes and impacts to the aquatic community.

Of the streams that drain the project area, Laurel Fork was selected to monitor the health of the streams with macroinvertebrates. Table 12 is a summary of the MAIS scores for the Laurel Fork drainage.

Table 12. MAIS Scores for Laurel Fork in the Wells Branch Project Area.

Stream	Date	MAIS Score	Assessment
Laurel Fork	6/5/2007	14	Good
	5/27/2008	17	Very Good
	5/24/2010	16	Good
	6/6/2011	16	Good

The invertebrate faunal assembly is dominated by species intolerant of polluted streams and is characteristic of a stream in dynamic equilibrium.

MAIS scores on other watersheds in the ecoregion will serve as controls during post-project monitoring to evaluate the effectiveness of standards, guidelines and mitigation measures in protecting aquatic macroinvertebrate communities. Stream water chemistry baselines and any anticipated effects are given in the Hydrology specialist report in chapter 3.2.2 of this document.

Direct, Indirect and Cumulative Effects

For purposes of this discussion, effects will be addressed to Management Indicator Species (MIS); Threatened, Endangered, and Sensitive Species (TES); and Locally Rare Species (LR).

Herbicides

The herbicides glyphosate and triclopyr were selected to control invasive species in Alternative 1.

Herbicides and their surfactants can be toxic to fish and mussel species. In fact, some surfactants can be “orders of magnitude” more toxic than the herbicides they are mixed with (Smith et al 2004). For this project, vegetable oil will be used for the surfactant with both chemicals. Vegetable oil is approved for use as a surfactant on National Forest lands and has shown to be a safer alternative than some other petroleum based chemicals (Smith et al 2004).

Sappington et al (2001) found that rainbow trout were a suitable surrogate for planning purposes when considering the effects to Threatened and Endangered species. Triclopyr has been approved for use on National Forest lands in the Southern Region (USDA 1989). Its effects on trout are generally benign and it has even been described as "practically non-toxic to fish" (Extoxnet 1993).

Glyphosate has been approved for use on National Forest lands in the Southern Region (USDA 1989). At recommended application rates, glyphosate has been shown to be safe to treat along irrigation canals (Folmar et al 1979). Mitchell et al (1987) classified two commercially available glyphosate formulations to be either "slightly toxic" or "practically non-toxic" to fish.

Forest Plan standards prohibit the application of herbicide within thirty feet of streams and the toxicity of these chemicals is very low.

Prescribed Burning
Alternative 2 proposes 2900 acres of prescribed burning.

The effects of prescribed fire on hydrologic properties such as water quality and quantity are related to factors such as 1) the severity of the burn; 2) the proportion of the watershed burned; 3) the relative proximity of the burned area to the stream channel; 4) the general slope of the watershed; and 5) the soil type (Beschta, B., 1990). The first three factors are influenced by the Burn Plan. The remaining factors are influenced by the properties of the site to be burned and are important with regard to sedimentation and erosion rates.

Cumulatively, where relatively "cool" burns occur, much of the organic matter comprising the forest floor will remain following the burning and the effects of burning on hydrologic and water quality variables will generally be minimal (Beschta, B., 1990).

The fire itself will be a ground fire with an average flame height of 2-12 feet. This will contribute to an overall "cool" burn if the project stays within prescription. Relatively cool burns should have little impact on erosion and sedimentation, regardless of general watershed slope (Beschta, B., 1990).

Fires will be allowed to back into riparian areas, minimizing the effects to the trees in the overstory. Canopy closure in the riparian zones should remain similar to present levels; therefore, stream water temperatures will be unaffected by the proposed burning.

Sediment
Table 9 of the Hydrology Effects section of this EA (Chapter 3.2.2) summarizes the anticipated sediment production for each Alternative. Sediment levels for Alternative 1 are estimated to be well within background levels for all the streams that drain the project area.

Sediment can affect fish directly, by aggravating the gills as they respire. It can also affect them by creating turbidity, which reduces their effectiveness as predators (Shaw and Richardson 2001). Indirectly, large amounts of sediment can fill in the interstitial spaces in the streambed where they spawn, making it more difficult to keep their eggs oxygenated.

The Riparian Standards of the Forest Plan are equivalent to the standards of the Mussel and Fish Conservation Plan, which was determined to be sufficient to protect aquatic threatened and endangered species by the US Fish and Wildlife Service (USDA 2003). There will be no change in the streambed composition or in aquatic habitat quality or complexity from sediment related to the project.

Direct and Indirect Effects

MIS

Wild trout are designated as an aquatic MIS under the Forest Plan. There are no wild trout in the project area or in the areas immediately downstream. There are no trout species native to the Powell River and there is no history of stocking in or near the project area. There are no other aquatic MIS designated in the Forest Plan; therefore, there will be no negative direct or indirect effects to the MIS wild trout from the proposed action.

Alternative 2

Alternative 2 is the No Action Alternative. For the same reasons given above, there will be no negative direct or indirect effects to the MIS wild trout.

TESLR Species

TES

No Threatened or Endangered species are known to exist in the project area. Nineteen TES aquatic species exist in the Powell River, but with the exception of the blackside dace, these occurrences are over 25 miles downstream and will not be discussed further. One Federally Threatened species covered by the Mussel and Fish Conservation Plan (MFCP), blackside dace, a species from the adjacent Cumberland River drainage in Kentucky has been introduced into the Reeds Creek 6th level HUC that includes Wells Branch, the Craborchard Creek Tributary, and the North Fork of the Powell River. The known occurrences are in small streams surrounding Cox Creek; approximately 5 river miles downstream from the project area. Blackside dace inhabit small coolwater streams and are not likely to be found in the main stem of the North Fork of the Powell River.

Effects to TES species from the proposed management activities have been addressed in the Biological Evaluation/Biological Assessment (BE/BA) for this project. What follows is a synopsis of the effects. For a full discussion of the effects to TES species by taxa, consult the BE/BA for this project in the Appendix.

Summary of Direct and Indirect Effects

Alternative 2

Alternative 2 proposes commercial and pre-commercial timber harvest, herbicide treatments, road construction and reconstruction, and prescribed burning.

As discussed above, there will be no measurable direct, indirect, or cumulative effects to the species covered by the Conservation Plan or other aquatic TES species, other than the effects discussed in the BE/BA for this project from the proposed management activities.

Alternative 1
Alternative 1 is the No Action Alternative.

There will be no direct, indirect, or cumulative adverse effects from taking no action on any TES species.

Locally Rare Species (LR)
A step-down process is employed to identify LR species that could be affected by any proposed action. First, the distribution of species on the locally rare list is checked to determine if they occur in the county where the action is proposed by consulting databases maintained by the Division of Natural Heritage of the Virginia Department of Conservation and Recreation (DNH) (http://webdat.dcr.virginia.gov/cfprog/dnh/naturalheritage/select_species.cfm), the USDA (Plants Database http://plants.usda.gov/java/), and the Virginia Department of Game and Inland Fisheries (DGIF) (http://vafwis.org/fwis/). If not, then the LR species were dropped from further consideration. Then, habitat needs were considered: for example, high elevation forest or glade, or spruce/fir forest, or riparian area, or cave. If the habitat of a particular species was not present in the proposed project area or it is a protected habitat type such as a wetland or riparian area, the species was dropped. The remaining five species are discussed under Aquatic LR Species below.

Aquatic LR Species
One fish (steelcolor shiner *Cyprinella whipplei*), one salamander (hellbender *Cryptobranchus alleganiensis*), and four freshwater mussels (elktoe *Alasmidonta marginata,* fragile papershell *Leptodea fragilis,* black sandshell *Ligumia recta,* and deertoe *Truncilla truncata*) can be found many miles downstream from the project area in the Powell river. These species occur in the same reaches of the Powell River that have T&E fish and mussels. As discussed in the BE for this project (Appendix X), these species occur many miles downstream from the project area, well beyond the area where effects from the proposed action would be measurable. This project will not affect the continued representation of these LR aquatic species downstream of the Forest.

Cumulative Effects

Summary-TES species
All projected sediment levels are expected to be well within background levels for these streams. For the proposed action, Forest Plan standards are adequate to protect all aquatic species. Prescribed burns are designed for low intensity in the riparian areas. Herbicide standards are adequate to protect both TES and aquatic MIS species. Therefore, no measurable cumulative negative effects to any TES species are anticipated from the selection of any of the alternatives.

3.3.4 Wildlife and Terrestrial Management Indicator Species (MIS)

The Clinch Ranger District is proposing to do vegetation management on an approximately 3800 acre block through a timber sale, prescribed burning, and herbicide application in Compartments 2081, 2082, 2088, 2089, 2090, and 2094 of the District. As described in the Jefferson National Forest Revised Land and Resource Management Plan (Plan), MIS have been chosen to represent threatened and endangered species, species with special habitat needs, species commonly hunted, fished, or trapped (demand species), non-game species of special interest, and species that indicate effects to major biological communities. Specific habitat objectives related to these species are located in several places throughout the Plan. Table 14 provides a guide for locating these objectives. The monitoring program outlined in Chapter 5 of the Plan contains specific objectives for these management indicator species. During the course of identifying any issues pertaining to a project, MIS are considered.

The MIS as determined in the Plan are Peaks of Otter salamander (*Plethodon hubrichti*), pileated woodpecker (*Dryocopus pileatus*), ovenbird (*Seiurus aurocapillus*), chestnut-sided warbler (*Dendroica pensylvanica*), hooded warbler (*Wilsonia citrina*), scarlet tanager (*Piranga olivacea*), eastern towhee (*Pipilo erythrophthalmus*), Acadian flycatcher (*Empidonax virescens*), pine warbler (*Dendroica pinus*), wild trout (brook trout *Salvelinus fontinalis*, brown trout *Salmo trutta*, and rainbow trout *Oncorhynchus mykiss*), white tailed deer (*Odocoileus virginianus*), eastern wild turkey (*Meleagris gallopavo*), and black bear (*Ursus americanus*). See table 13 below for MIS selections and justifications for these selections.

Table 13- MIS selected for the Wells Branch Vegetation Management Timber Sale Project Area.

Taxa	Selected as an MIS (Y/N)	Justification
Peaks of Otter Salamander (*Plethodon hubrichti*)	N	Known only from the Peaks of Otter in Virginia
Pileated Woodpecker (*Dryocopus pileatus*)	Y	Detected in survey
Ovenbird (*Seiurus aurocapillus*)	Y	Detected in survey
Chestnut-sided Warbler (*Dendroica pensylvanica*)	Y	Not detected in survey, habitat could be created/enhanced with management activities
Acadian Flycatcher (*Empidonax virescens*)	Y	Detected in survey
Pine Warbler (*Dendroica pinus*)	N	Not detected in survey, activities not in known range, activities to create habitat will not occur
Hooded Warbler (*Wilsonia citrina*)	Y	Detected in survey
Scarlet Tanager (*Piranga olivacea*)	Y	Detected in survey
Eastern Towhee	Y	Detected in survey

(*Pipilo erythrophthalmus*)		
Eastern Wild Turkey (*Meleagris gallopavo*)	Y	Detected in survey
Black Bear (*Ursus americanus*)	Y	Detected in survey
Deer (*Odocoileus virginianus*)	Y	Detected in survey
Wild Trout (brook trout *Salvelinus fontinalis*, brown trout *Salmo trutta*, and rainbow trout *Oncorhynchus mykiss*)	N	No history of stocking. No trout detected in VDGIF or surveys*

* Discussed in the MIS discussion in the Fisheries section of this EA.

For detailed discussion of the specific habitats or communities represented by the MIS, please refer to the Plan, Chapter 2 (Forestwide Direction), pages 2-10 through 2-18 which is the section "Wildlife and Threatened, Endangered, and Sensitive Species Habitat." Table 14 below shows the related objective, management prescription or desired condition for the individual species that will be considered in this environmental analysis. The management prescriptions for this project are 8A1 (Mix of Successional Habitats), 7B (Scenic Corridor), 7D (Concentrated Recreation Area), and 4D (Botanical and Zoological Area).

Species Common Name	Category (s)
Pileated Woodpecker	Special Habitat Indicator
Ovenbird	Special Habitat Indicator
Chestnut-sided Warbler	Special Habitat Indicator
Acadian Flycatcher	Special Habitat Indicator
Hooded Warbler	Biological Community Indicator
Scarlet Tanager	Biological Community Indicator
Eastern Towhee	Biological Community Indicator
Eastern Wild Turkey	Demand Species Indicator
Black Bear	Demand Species Indicator
Deer	Demand Species Indicator

Table 14. Related management prescription for the individual MIS as described in the GWJNF Plan, from the Table on Plan page 2-12.

SPECIAL HABITAT INDICATORS

Special habitat attributes such as hard and soft mast, den trees, snags, downed wood, and brushy areas are necessary elements for certain species. A variety of Plan goals, objectives, and standards provide for the protection, restoration, and maintenance of these elements.

SNAGS AND DOWNED WOOD HABITAT INDICATOR: PILEATED WOODPECKER (*Dryocopus pileatus*)

The pileated woodpecker generally prefers mature deciduous forests ranging from bottomlands to uplands. Key habitat requirements include older mature forests with dead trees (snags) for nesting. Pileated woodpeckers will also nest in large dead limbs on live trees. Nests are large cavities they construct usually more than 30 feet above the ground. They feed on ants, insects, and insect larvae (mainly carpenter ants and wood-boring beetles) found by probing under the bark of standing trees and stumps or fallen logs. Some fruits and berries are taken in fall and winter. The pileated woodpecker is a permanent resident, and is an MIS for snag dependent wildlife.

Direct Effects and Indirect Effects

Field surveys indicate that snags are found across the proposed project area (project file). **Alternative 1** will result in an approximate 285 acre reduction (except for leave trees) of existing mature forest for nesting, and loss of the cavities and snags found there. More than **91**% of the project area will remain as mature forest with snags, aging naturally. This action may provide more downed wood for the pileated woodpecker. This harvest action may temporarily affect pileated woodpecker nesting habitat due to the loss of mature trees, but may be a beneficial effect for foraging due to the potential increase in downed wood.

Thinning and regeneration treatments will mark and protect snags (see mitigation measures). Prescribed burning may also create scattered tree mortality, resulting in new snags and downed wood. In addition, riparian areas are not included in either type of harvest treatment, further protecting pileated woodpecker habitat. Herbicide treatment should have no direct effect on the pileated woodpecker since the targeted species are mostly herbaceous or brush species, or if an *Ailanthus* tree, are small or few in number. Herbicide treatments will be spot treatments, to remove competing vegetation. Construction of roads, temporary roads, and openings should have no direct effect on the pileated woodpecker since the total acreage of construction would be less than 20 acres. Skid trails should have no direct effect on the pileated woodpecker since there is no construction involved and snags would be protected under the mitigation measures.

Alternative 2 will result in no reduction of existing mature forest for nesting, or loss of the cavities and snags found there. The project area will remain as mature forest with snags, aging naturally. There would be no direct effect to the pileated woodpecker, since trees in a mature forest will die eventually, creating snags naturally.

Cumulative Effects

In **Alternative 2**, the majority of the project area (91%) will remain as mature forest, herbicide treatments will target invasive or undesirable species, prescribed burning should either be benign or have a beneficial effect, and while the constructed roads and openings will remain, the skid

trails will become reforested naturally; therefore, there will be no cumulative effects on the pileated woodpecker from implementing the proposed actions in Alternative 1.

Alternative 1 is the "no action" alternative. There would be no cumulative effects to the mature pileated woodpeckers, since trees in a mature forest will die eventually, creating snags naturally. However, there will be little or no foraging/maturation areas for the pileated woodpecker fledglings, which may have a cumulative impact on the population levels of the pileated woodpecker.

Based on the results of long-term monitoring data, pileated woodpeckers show overall stable population trends on the GWJNFs and increasing trends both statewide and across the Blue Ridge Mountain and Ridge and Valley Regions (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species). Pileated woodpeckers have the abundance and distribution across the Forests that will provide for their persistence into the foreseeable future. With the remaining mature forest, and the beneficial openings providing post-breeding foraging habitat and juvenile maturation and foraging habitat created through the harvest activities, there should be no cumulative effects to the pileated woodpeckers from the implementation of the proposed action alternative.

INTERIOR FOREST HABITAT INDICATOR: OVENBIRD (*Seiurus aurocapillus*)

Ovenbirds are interior forest habitat indicators, requiring mature deciduous forest interior with a moderately dense understory, preferring hilly terrain. They favor rather dry deciduous forests for breeding and will nest in mixed forests with a deciduous understory. They will glean prey from leaf litter or soil, seldom foraging in trees. Their nests are placed on the ground in leaf litter.

Ovenbirds are area sensitive, requiring relatively large forested patches. As ground nesters, they are especially vulnerable to predators (Robbins et al. 1989). While the need for large patches of mature forested habitat for nesting has been well documented for many migratory birds species, including ovenbirds, evidence is mounting that early successional habitats are also important for these same species during the critical time periods just after breeding and during migration (Anders et al. 1996 and 1998, Vega Rivera et al. 1998 and 1999, Pagen et al. 2000, and Hunter et al. 2001). Recent research has documented that post-breeding adults and fledgling ovenbirds (as well as many other mature forest bird species such as wood thrushes, red-eyed vireos, Kentucky warblers, black-and-white warblers, and hooded warblers) move from their nesting habitats in mature forests to areas characterized by dense, woody vegetation, abundant insect availability, and the presence of ripe fruits (Anders et al. 1998, Vega Rivera et al. 1998, 1999). These areas provide "safe havens" for molting, abundant food for the buildup of fat reserves for migration, and protection from predators. Habitats supporting this kind of vegetation, and where these species were found, include open oak, oak/pine, and pine woodlands, patches of early successional habitat resulting from insect infestation and natural disturbance such as ice storms, patches of early successional habitat where the overstory had been thinned or harvested in some way, areas of second growth scrub/deciduous saplings located along forest borders and old fields, and mature riparian forests with a dense understory (Anders et al. 1998, Vega Rivera et al. 1998, 1999). The availability of post-fledgling habitat for juvenile birds such as ovenbirds near their nesting habitat is critical to their survival, due to the inexperience of juveniles in foraging

and avoiding predators (Anders et al. 1998). Several studies have also documented the need for patches of early successional woody habitat within a largely forested landscape to provide abundant food resources and protective cover for migratory bird species during migration (Kilgo et al. 1999, Suthers et al. 2000, Hunter et al. 2001). These studies strongly recommend conservation strategies that maintain large tracts of mature forest, within which there is a mosaic of different forest types and ages (early and mid-successional forest stands), to provide the habitat requirements needed by migratory birds such as ovenbirds, during all their life stages here in North America.

Direct Effects and Indirect Effects

Alternative 2 will result in a 285 acre reduction of existing interior forest for ovenbird nesting, while creating early successional habitat suitable for post-breeding foraging and juvenile maturation and foraging. This species would be displaced from regeneration harvest units. However, approximately **91**% of forest interior habitat would remain within the project area, and needed habitat would be available. Plus, this effect would be temporary; the trees would regrow and the habitat would eventually become as desired by the ovenbird. Thinning leaves most of the canopy, and creates some gaps that would benefit the ovenbirds, both for foraging habitat for fledglings and post-breeding times as described above. Prescribed burning may also create scattered tree mortality, resulting in new, small openings in the canopy. If prescribed burning is conducted during the dormant season, the ovenbirds would not be present in the area, so there would be no direct effect. Herbicide treatment should have no direct effect on the ovenbird since the targeted species are mostly herbaceous or brush species, or if an *Ailanthus* tree, are small or few in number. Herbicide treatments will be spot treatments, to remove competing vegetation. Construction of roads, temporary roads, and openings should have no direct effect on the ovenbird since there would be a majority of the mature forest remaining, and the openings present foraging and maturation opportunities for ovenbird young. Skid trails could have a temporary direct effect on the ovenbird; although there is no construction involved, individual nests could be crushed during operations. However, adult birds would be able to escape the immediate area and nest elsewhere in the remaining mature forest.

Alternative 1 is the "no action" alternative. There would be no direct effect to the adult ovenbird, since the mature forest would remain, but there would be little opportunity for fledglings to learn to forage and mature.

Cumulative Effects

In **Alternative 2**, the majority of the project area (**91**%) will remain as mature forest, herbicide treatments will target invasive or undesirable plant species, prescribed burning should either be benign or have a beneficial effect, and while the constructed roads and openings will remain, the skid trails will become reforested naturally; therefore, there will be no cumulative effects to the ovenbird from implementing the proposed action in Alternative 1.

Alternative 1 is the "no action" alternative. There would be no cumulative effect to the adult ovenbird, since the mature forest would remain, but there would be little opportunity for fledglings to learn to forage and mature, which may have a cumulative impact on the population levels of the ovenbird.

Based on the results of long-term monitoring data, ovenbirds show overall stable population trends on the GWJNFs and increasing trends both statewide and across the Blue Ridge Mountain and Ridge and Valley Regions (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species). Ovenbirds have the abundance and distribution across the Forests that will provide for their persistence into the foreseeable future, and with the abundance of mature forest nearby, there should be no cumulative effects to the ovenbird. With the remaining mature forest, and the beneficial openings providing post-breeding foraging habitat and juvenile maturation and foraging habitat created through the harvest activities, there should be no cumulative effects to the ovenbird from the implementation of the proposed action alternative.

EARLY SUCCESSIONAL HABITAT INDICATOR: CHESTNUT-SIDED WARBLER (*Dendroica pensylvanica*)

Chestnut-sided warblers prefer a dense, brushy habitat with an open overstory, or open, second-growth woods, generally hardwoods. They would be found in early successional habitat such as regeneration areas or overgrown fields. A key habitat requirement is deciduous saplings. The chestnut-sided warbler's nest is low in a sapling or shrub, in an overgrown field or thicket, and foraging for their insect prey is done in this type habitat.

On the Forest the chestnut-sided warbler is found in the Blue Ridge, Ridge and Valley, and Cumberland mountains, usually above 2500 feet in elevation. It nests 1 to 4 feet above the ground in saplings and shrubs and feeds on insects gleaned from leaves and twigs in deciduous vegetation (Hamel, 1992). The chestnut-sided warbler is an MIS for high-elevation early-successional habitats because of its strong association with these habitats, and because its populations should be responsive to forest management efforts that create and sustain such habitats.

Direct Effects and Indirect Effects

Alternative 2 will result in a 285 acre gain of early successional habitat that would be created, and habitat of this type above 2500 feet in elevation would benefit the chestnut-sided warbler. Several of the proposed cutting units are above 2500 feet in elevation. Thinning leaves most of the canopy, and creates some gaps that would benefit the chestnut-sided warbler, both for nesting habitat and foraging habitat for fledglings and post-breeding times. Prescribed burning may also create scattered tree mortality, resulting in new, small openings in the canopy. The use of prescribed fire may result in some small patches of regeneration, which would benefit this species. If prescribed burning is conducted during the dormant season, the chestnut-sided warbler would not be present in the area, so there would be no direct effect such as mortality. Herbicide treatment should have no direct effect on chestnut-sided warbler since the treatment will be hand-applied, spot treatments and should not affect non-target (native or desired) species. Construction of roads, temporary roads, and openings would have a beneficial direct effect on the chestnut-sided warbler since they prefer openings, and the openings present foraging and nesting opportunities. Skid trails could have a temporary beneficial effect on the chestnut-sided warbler which would end once the skid trails revert back to mature forest.

Alternative 2 is the "no action" alternative. This will result in no additional early successional habitat, limiting suitable habitat for this species.

Cumulative Effects

Alternative 1 harvest, road-building, herbicide treatment, and prescribing burning activities would have temporary beneficial cumulative effects for the chestnut-sided warbler, for approximately 10 to 15 years in the harvest units and indefinitely along the edges of, and within, the permanent openings as long as they are maintained as such.

Alternative 2 is the "no action" alternative. The cumulative effect to the chestnut-sided warbler would be possible decline in numbers, since there are no acres of early successional habitat in the project area, and only openings created through natural processes would occur. The forest would continue to mature naturally.

Chestnut-sided warblers would benefit from the early successional habitat created in the regeneration cuts as long as the habitat remains in a "brushy" state (probably 10-15 years), and would benefit from the edge habitat in the permanent openings and along the roads as long as they are maintained. Based on the results of long-term monitoring data, chestnut-sided warblers show a stable population trend on the George Washington and Jefferson National Forests and in the larger Blue Ridge physiographic area, with an abundance and distribution across the Forests that will provide for their persistence into the foreseeable future. However, steadily declining trends in the Ridge and Valley region and statewide across Virginia are cause for concern (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species).

Chestnut-sided warblers have exhibited significant continental population declines in the last couple of decades, mirroring an overall trend of decline of disturbance-dependent bird species associated with open habitats in eastern North America (Vickery 1992, Askins 2000, Hunter et al. 2001). A significantly greater proportion of bird species exhibiting steep population declines are associated with disturbance-mediated habitats than in forested or generalist habitat types (Brawn et al. 2001). Forty percent of all North American species associated with some type of disturbance-mediated habitat (grassland, shrub-scrub, open woodlands) have been significantly decreasing in population since 1966 (Brawn et al. 2001). Recent research highlights the importance of early successional woody habitat for post-breeding and migratory stop-over needs of forest-interior migratory bird species in a larger landscape of mature forest (see sections on ovenbirds and hooded warblers), and the role of early successional habitat in largely mature, forested landscapes; the need to restore/maintain disturbance regimes creating such habitats is of vital importance in conservation planning (Brawn et al. 2001, Hunter et al. 2001). There should be beneficial effects to the chestnut-sided warbler from the action alternative as long as the early successional habitat persists.

RIPARIAN HABITAT INDICATOR: ACADIAN FLYCATCHER (*Empidonax virescens*)

Acadian flycatchers are found in mature, moist riparian forests, along perennial streams and rivers. Nests are usually built in the deciduous trees, over a stream. They will sit near the stream on a branch anywhere from 10 to 40 feet off the ground, beneath the hardwood canopy, and forage after flying insects.

The Acadian flycatcher is an appropriate species to indicate management-induced changes to mature riparian forests. It is highly associated with mature deciduous forests along streams and bottomland hardwoods throughout the Forest. This species is selected to help indicate the effects of management activities on this type habitat. All the perennial streams provide habitat for this species.

Direct Effects and Indirect Effects

Alternative 2 would create 285 acres of early successional habitat, providing abundant food resources and protective cover for both adult and juvenile Acadian flycatchers immediately post-nesting and during migration. Because riparian areas are protected from thinning and regeneration treatments, nesting habitat will be maintained throughout the proposed project area. Herbicides in this alternative may be used within the riparian zone, as long as it is beyond 30 feet from the streambank; however, there should be no effect to the Acadian flycatcher since the herbicide will be spot-applied to the target species, to remove competing vegetation. Herbicide treatment should have no direct effect on the Acadian flycatcher since the targeted species are mostly herbaceous or brush species, or if an *Ailanthus* tree, are small or few in number. Prescribed burning should have no effect on the Acadian flycatcher since mature trees within the riparian zone would not be affected by the "cool" nature of the burn. If prescribed burning is conducted during the dormant season, the Acadian flycatcher would not be present in the area, so there would be no direct effect such as mortality.

Alternative 1 (the no-action alternative) will result in no loss of existing mature forest for nesting, but due to a lack of early successional habitat, there would be a very limited amount of suitable habitat for post-breeding, juvenile foraging and maturation, and migration needs.

Cumulative Effects

Alternative 2 harvest, road-building, herbicide treatment and prescribed burning activities would create the necessary early successional habitat needed by Acadian flycatchers for post-breeding and juvenile maturation and foraging which may be a beneficial cumulative effect; riparian areas containing nest trees are excluded from harvest, so there would be no cumulative effect to the Acadian flycatcher from the proposed activities in Alternative 1.

Alternative 1 is the "no action" alternative; forest processes would occur naturally in the project area. Little early successional habitat would be present for the post-breeding and juvenile maturation and foraging life-stages, which may have a cumulative impact on the population levels of the Acadian flycatcher.

Based on the results of long-term monitoring data, Acadian flycatchers indicate overall stable population trends on the GWJNFs and state-wide across Virginia, and have the abundance and distribution across the Forests that will provide for their persistence into the foreseeable future (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species). Though such trends are not apparent on the GWJNFs, of concern are declining trends shown by USGS (United States Geological Survey) BBS (Breeding Bird Survey) data in populations of Acadian flycatcher throughout the larger regions of the Blue Ridge Mountains and Ridge and Valley Region. Recent research strongly recommends conservation strategies that maintain large tracts of mature

forest, within which there is a mosaic of different forest types and ages (early and mid-successional forest stands), as well as mature riparian forest, to provide the habitat requirements needed by migratory birds during all of their life stages here in North America, including the Acadian flycatchers (Kilgo et al. 1999, Suthers et al. 2000, Hunter et al. 2001). With the action alternatives, combined with the maintenance of over 80% of forested acres in mature forest condition (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species), the GWJNFs should be able to provide the mosaic of forest types and ages recommended by research for migratory birds such as Acadian flycatcher during the life history stages (breeding, post-breeding, migration) during which they utilize GWJNF lands.

With designation of riparian corridors and their protection, no impacts would be expected upon local Acadian flycatcher populations. Prescribed burning may be allowed to occur in riparian areas, but no negative impacts are expected as the mesic conditions and heavy shade in riparian areas would result in very low intensity fires ("cool" burns). Herbicide application may benefit the Acadian flycatcher by removing the competitive plant species from the post-breeding, migration, and juvenile foraging, early successional habitat. There should be no cumulative impacts to the Acadian flycatcher from implementation of the action alternative.

BIOLOGICAL COMMUNITY INDICATORS

Some species can indicate effects to major biological communities and whether management activities are successful in maintaining or restoring composition, structure and function of forest communities.

DENSE UNDER- AND MID-STORY IN MESIC MATURE FOREST INDICATOR: HOODED WARBLER (*Wilsonia citrina*)

The hooded warbler prefers dense brushy areas in moist deciduous woodlands or ravines with forest canopy overhead, and sometimes the deciduous understory of mature pine forests. They usually nest in shrubs or saplings, about 2 to 5 feet off the ground. Foraging for insects is done primarily in shrubs up to 15 feet off the ground. Hooded warblers would help to indicate whether habitats such as this are being maintained or developed.

The hooded warbler is an MIS for dense, brushy areas in deciduous woodlands or ravines because of its strong association with these habitats, and because its populations should be responsive to forest management efforts that create and sustain such habitats.

Direct Effects and Indirect Effects

Alternative 2 will create 285 acres of early successional habitat, providing abundant food resources and protective cover for both adult and juvenile hooded warblers immediately post-nesting, during migration, and for juvenile foraging. Because riparian areas are protected from thinning and regeneration treatments, nesting habitat will be maintained within those areas. Herbicides in this alternative may be used within the riparian zone, as long as it is beyond 30 feet from the streambank; however, there should be no effect to the hooded warbler since the herbicide will be spot-applied to the target species. Herbicide treatments are spot treatments to remove competing vegetation.

The use of prescribed fire may result in some small patches of regeneration, which could benefit this species; however, it is not expected that prescribed fire would burn in a moist area. If prescribed burning is conducted during the dormant season, the hooded warblers would not be present in the area, so there would be no direct effect such as mortality. With the remaining acres of forest (approximately **91**% in the project area would remain as mature forest) that have dense understory, there should be enough mesic, brushy habitat for the hooded warblers to disperse into as necessary, and therefore, no direct effect to the hooded warbler from the proposed actions should occur.

Construction of roads, temporary roads, and openings should have no direct effect on the hooded warbler since the total acreage of construction would be less than 20 acres. Skid trails should have no direct effect on the hooded warbler since there is no construction involved.

Alternative 1 (the no-action alternative) will result in no loss of existing deciduous forest and brushy understory for nesting, but a very limited amount of suitable habitat for post-breeding, juvenile foraging and cover, and migration needs would be present at any given time since natural processes would be occurring.

Cumulative Effects

Alternative 2 harvest, road-building, herbicide treatment and prescribed burning activities would create early successional habitat; this would be a beneficial cumulative effect as long as the early successional areas needed for post-nesting and juvenile maturation and foraging are maintained. Remaining mature deciduous forest with a dense understory would be available for nesting areas for adult hooded warblers, so there should be no cumulative effect to the hooded warblers.

Alternative 1 is the "no action" alternative. Forest processes would continue naturally; however, there will be little early successional habitat for post-nesting and juvenile foraging and maturation needs, which may have a cumulative effect on hooded warbler populations.

Based on the results of long-term monitoring data, hooded warblers indicate overall stable population trends on the GWJNF's and stable to increasing trends in the larger physiographic regions of the Blue Ridge, the Ridge and Valley, and state-wide across Virginia (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species). Recent research strongly recommends conservation strategies that maintain large tracts of mature forest, within which there is a mosaic of different forest types and ages (early and mid-successional forest stands), as well as mature riparian forest, to provide the habitat requirements needed by migratory birds during all of their life stages here in North America, including the hooded warbler (Kilgo et al. 1999, Suthers et al. 2000, Hunter et al. 2001). With the action alternatives, combined with the maintenance of over 80% of forested acres in mature forest condition (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species), the GWJNFs should be able to provide the mosaic of forest types and ages recommended by research for migratory birds such as hooded warblers during the life history stages (breeding, post-breeding, migration) during which they utilize GWJNF's lands. Hooded warblers exhibit the abundance and distribution across the

Forests that will provide for their persistence into the foreseeable future. There should be no cumulative effects to the hooded warbler from implementation of the action alternative.

DRIER MID- TO LATE-SUCCESSIONAL FOREST INDICATOR: SCARLET TANAGER (*Piranga olivacea*)

Scarlet tanagers prefer a drier, mature forest, either oak or oak-pine uplands; they are usually less numerous in the mixed forest type. Scarlet tanagers prefer to nest 30 feet or higher in the tree canopies, and glean insects from the tree foliage.

The scarlet tanager is an MIS for drier, more mature forested habitats because of its strong association with these habitats, and because its populations should be responsive to forest management efforts that create and sustain such habitats.

Direct Effects and Indirect Effects

Alternative 2 would mean a reduction of mature forest in the amount of 285 acres for the scarlet tanager, but at the same time, that much early successional habitat for post-breeding, migration, and juvenile foraging and maturation would be created. Approximately **91**% of the project area would remain in mature forest, and enough of the drier habitat preferred by the scarlet tanager should remain for its nesting needs. The scarlet tanager would be able to disperse into these areas as needed. There should be no effect to the scarlet tanager from the harvest activities. Herbicides would be used in this alternative, but there should be no effect to the scarlet tanager since the treatments are spot treatments to remove competing vegetation; brushy vegetation and small, widely scattered *Ailanthus* trees would receive the treatment. Prescribed burning is planned for this alternative, but there should be no effect to the scarlet tanager if the burn is conducted according to the set parameters. If the burn is conducted during the dormant season, there would be no scarlet tanagers in the area; therefore, there will be no effect to the scarlet tanager from these activities.

Construction of roads, temporary roads, and openings should have no direct effect on the scarlet tanager since the total acreage of construction would be less than 20 acres. Skid trails should have no direct effect on the scarlet tanager since there is no construction involved.

Alternative 1 is the no-action alternative, and will result in no loss of existing mature forest for nesting, but there will be a very limited amount of suitable habitat for post-breeding, migration, and juvenile foraging and cover needs.

Cumulative Effects

Alternative 2 activities of harvest, road-building, herbicide treatment and prescribed burning would create early successional habitat for post-nesting, migration, and juvenile foraging and maturation, which would be a beneficial cumulative effect as long as the early successional habitat is maintained as such. The majority of the project area would remain in mature forest, so there should be no cumulative effects to the scarlet tanagers.

Alternative 1 is the "no action" alternative. Forest conditions would continue naturally, and there would be little early successional habitat for the post-nesting, juvenile foraging and

maturation needs of the scarlet tanager. This may have a cumulative effect on the population of the scarlet tanager in the project area.

Based on the results of long-term monitoring data and habitat evaluation, scarlet tanagers exhibit stable to increasing population trends on the GWJNFs as well as the larger physiographic regions of the Blue Ridge, the Ridge and Valley, and state-wide across Virginia (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species). Recent research strongly recommends conservation strategies that maintain large tracts of mature forest, within which there is a mosaic of different forest types and ages (early and mid-successional forest stands), as well as mature riparian forest, to provide the habitat requirements needed by migratory birds during all of their life stages here in North America, including the scarlet tanager (Kilgo et al. 1999, Suthers et al. 2000, Hunter et al. 2001). With the action alternatives, combined with the maintenance of over 80% of forested acres in mature forest condition (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species), the GWJNFs should be able to provide the mosaic of forest types and ages recommended by research for migratory birds such as scarlet tanagers during the life history stages (breeding, post-breeding, migration) that they utilize GWJNF lands. Scarlet tanagers exhibit the abundance and distribution across the Forests that will provide for their persistence into the foreseeable future. There should be no cumulative effects to the scarlet tanager from the action alternative.

EARLY-SUCCESSIONAL FOREST INDICATOR: EASTERN TOWHEE (*Pipilo erythrophthalmus)*

The eastern towhee prefers brushy and overgrown areas, such as overgrown fields or early successional forest. They are found in woodland margins, thickets, woodland understory, cutover woods, and shrubbery in residential areas. The eastern towhee nests in thickets or brushy places on the ground, or possibly in shrubs up to 5 feet off the ground. Foraging is done on the ground by scratching in the leaf litter to find insects, seeds and fruits.

The towhee is an MIS for early-successional habitats because of its strong association with these habitats, and because its populations should be responsive to forest management efforts that create and sustain such habitats.

Direct Effects and Indirect Effects

Alternative 2 proposes prescribed fire, thinning and regeneration harvest treatments, and herbicide treatments that would create patches of shrubs and saplings, which would benefit this species. Thinning treatments would create limited shrub and sapling development, resulting in some beneficial effect for this species. Regeneration treatments would stimulate thick growth of shrubs and saplings over 285 acres, creating habitat beneficial to the eastern towhee for all its life stages. The use of prescribed fire may result in some small patches of regeneration which would benefit this species. Herbicides would be used in this alternative, and the treatments are spot treatments to remove competing vegetation. The eastern towhee may benefit from the herbicide treatment since some of the treatments would remove competing non-native vegetation from the early successional habitat preferred by the eastern towhee.

Construction of roads, temporary roads, and openings would have a beneficial effect on the eastern towhee since early successional habitat would be created. Skid trails would have a beneficial effect on the eastern towhee until the skid trails revert back to mature forest.

Alternative 1 is the no-action alternative, and will result in no additional early successional habitat, resulting in limited suitable habitat for the eastern towhee.

Cumulative Effects

Alternative 2 harvest, road-building, herbicide treatment, and prescribing burning activities would have temporary beneficial cumulative effects for the eastern towhee, for approximately 10 to 15 years in the harvest units and indefinitely along the edges of, and within, the permanent openings as long as they are maintained as such.

Alternative 1 is the "no action" alternative. The cumulative effect to the eastern towhee would be possible decline in numbers, since there are no acres of early successional habitat in the project area, and only openings created through natural processes would occur. The forest would continue to mature naturally.

Eastern towhees would temporarily benefit from the early successional habitat created in the thinning and shelterwood cuts, probably for 10 to 15 years, and would benefit from the edge habitat in the permanent openings as long as they are maintained. Eastern towhees show a stable population trend on the GWJNFs, statewide across Virginia, and in the Blue Ridge region, indicating an abundance and distribution across the Forests that will provide for their persistence into the foreseeable future (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species). However, steadily declining trends in the Ridge and Valley region are cause for concern.

Eastern towhees have exhibited significant continental population declines in the last couple of decades, mirroring an overall trend of decline of disturbance-dependent bird species associated with open habitats in eastern North America (Vickery 1992, Askins 2000, Hunter et al. 2001). A significantly greater proportion of bird species exhibiting steep population declines are associated with disturbance-mediated habitats than forested or generalist habitat types (Brawn et al. 2001). Forty percent of all North American species associated with some type of disturbance-mediated habitat (grassland, shrub-scrub, open woodlands) have been significantly decreasing in population since 1966 (Brawn et al. 2001). Combined with recent research highlighting the importance of early successional woody habitat for post-breeding and migratory stop-over needs of forest-interior migratory bird species in a larger landscape of mature forest (see sections on ovenbirds and hooded warblers), the role of early successional habitat in largely mature, forested landscapes and the need to restore/maintain disturbance regimes creating such habitats is of vital importance in conservation planning (Brawn et al. 2001, Hunter et al. 2001). In the action alternative, creation of early successional habitats should have a beneficial effect for the eastern towhee.

DEMAND SPECIES

The Jefferson National Forest provides large public ownership with opportunities for hunting, fishing, and wildlife viewing. The following species are selected as Management Indicator Species where effects of national forest management are important to meeting public demand. Monitoring of hunting/harvests will indicate whether management of the habitat is being done at appropriate levels.

EASTERN WILD TURKEY (*Meleagris gallopavo*)

Eastern wild turkeys need several successional stages for their lifespans: mature forests are needed for mast production, brushy areas are needed for hiding of the nests, and open grassy or herbaceous areas are needed for poult bugging areas.

Turkey populations benefit from the increase in nesting habitat created by the increase in ground level cover and increased brood range. The revegetation of new permanent roads, skid roads, and log landings would provide grass/forb habitat resulting in an improved source and distribution of insects (especially grasshoppers) and associated protein for young turkeys (poults). The selection of good mast producers as reserve trees would insure a continuous supply of mast within harvested areas. Hard mast (acorn) production would not decline significantly in the project area, and in fact, would be expected to increase through time given treatments which will increase mast production and the use of prescribed fire, which will enhance oak establishment for the future.

Direct and Indirect Effects

Alternative 2 proposes regeneration and thinning cuts, road-building, herbicide treatments, and prescribed burning. The thinning will create some patches of brushy habitat that will benefit the wild turkeys during the nesting and bugging seasons, and the regeneration cuts will create 285 acres of brushy habitat. The brushy areas will benefit the turkeys and poults while the early successional stage persists: 10 to 15 years for the harvest areas and as long as the permanent openings are maintained. The acres of mature forest (**91**%) that will remain in the project area will provide mast (acorns, hickory nuts, etc) that will benefit mature turkeys in the fall and winter. Herbicide treatments are spot treatments to remove competing vegetation. There should be no adverse effects to the wild turkey from the herbicide treatments. Early spring prescribed burning could possibly destroy nests and eggs, but turkey hens will often nest again when the eggs are destroyed through natural processes such as predation by raccoons or coyotes. The overall improvement to habitat in the following years should benefit the wild turkey.

Construction of roads, temporary roads, and openings should have no direct effect on the wild turkey since there would be a vast majority of the mature forest remaining, and the openings present foraging and maturation opportunities for turkey young. Skid trails could have a temporary direct effect on the turkey; although there is no construction involved, individual nests could be crushed during operations. However, adult birds would be able to escape the immediate area and nest elsewhere in the remaining forest.

Alternative 1, the "no action alternative," will not provide more openings for wild turkeys, but the mature forest will remain, providing mast for turkeys in the fall and winter seasons. There

will be a lack of openings that would be used by hens and poults for nesting and foraging, other than those created naturally through tree-fall or wildfires.

Cumulative Effects

Alternative 2 harvest activities, road-building, herbicide treatments and prescribed burning will create some patches of brushy habitat that will benefit the wild turkeys during the nesting and bugging seasons; the brushy areas will benefit the turkeys and poults while the early successional stage persists: 10 to 15 years for the harvested areas, and as long as the permanent openings are maintained. The acres of mature forest (**91**%) that will remain in the project area will provide mast (acorns, hickory nuts, etc) that will benefit turkeys in the fall and winter.

Alternative 1 is the "no action" alternative, and forest processes would occur naturally. There will be little early successional habitat for the adult turkeys' foraging and poult bugging, so the cumulative effect for the wild turkey could be a reduction in numbers.

Based on the results of long-term monitoring data, wild turkeys show overall stable to increasing population trends on the GWJNFs (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species). With the action alternatives, proposed projects such as this, combined with the maintenance of over 80% of forested acres in mature forest condition, the GWJNFs should be able to provide the mosaic of forest types and ages recommended by research for avian species such as wild turkey during the life history stages (breeding, post-breeding, wintering) during which they utilize GWJNF lands. Wild turkeys have the abundance and distribution across the Forests that will provide for their persistence into the foreseeable future. With the action alternative, there should be beneficial effects to the wild turkey.

BLACK BEAR (*Ursus americanus*)

Black bears need large areas with little or no disturbance such as repeated interaction with humans. Black bears use different successional stages for their needs. Mature forests provide mast such as acorns or beech nuts, as well as snags for denning, and early successional habitat provides berries and green vegetation for eating.

Most of the diet of black bears comes from vegetable matter such as hard and soft mast, succulent herbaceous material and fruits of evergreen shrubs and vines. Animal foods such as insects, honey, fish, frogs, small rodents, rabbits, fawns, bird eggs, and carrion make up about 3% of their annual diet. (Linzey, 1998) Soft mast becomes a very important food source in late summer through fall for building stores of body fat. Body fat is a critical factor in bear survival and reproduction.

Potential den trees are those greater than 20 inches diameter at breast height (DBH). Potential den trees also include those that are hollow with broken tops or those with limbs greater than 12 inches diameter, broken near the bole of the tree. These trees are identified when marking commercial timber sales and are marked as leave trees. Thinning and regeneration treatments will mark and protect snags (see mitigation measures), and should result in little additional loss of cavities beyond natural disturbance processes. Prescribed burning may also create scattered tree mortality, resulting in new snags and downed wood, which would benefit the black bears.

System roads within the proposed project area will be gated and permanently closed following project work; there should be no effect to black bears from vehicle activity such as would occur on open roads.

Direct and Indirect Effects

The thinning treatments, regeneration treatments, road-building, herbicide treatments and prescribed burning proposed in **Alternative 2** would create patches of early successional habitat in the thinnings, and 285 acres of early successional habitat in the regeneration treatments, providing increased soft mast production from species such as grape, blueberry, blackberry, greenbrier and other species. The remaining mature forest within the project area (**91**% of the project area) would continue to provide the hard mast such as acorns, hickory nuts, etc. Thinned areas would have increased acorn production due to the removal of competing vegetation from the oak-areas. The use of prescribed fire would enhance oak establishment since oak species are fire-tolerant; the fire-intolerant species would be "knocked back" or killed with the prescribed fire. Herbicide treatments are spot treatments to remove competing vegetation. Construction of roads, temporary roads and openings should have no direct effect on the black bear since there would be a vast majority of the mature forest remaining, and the openings present foraging opportunities for soft mast and low green vegetation. Skid trails should have no effect on the black bear since they are not constructed and are temporary. There should be beneficial effects to the black bear from these activities.

Alternative 1, the "no action alternative," will result in no loss of existing mature forest, but will provide only a very limited amount of suitable early successional habitat for black bear from natural processes. This alternative would not provide necessary black bear habitat components since no early successional habitat would be created to meet the soft-mast and green vegetation needs of the black bears.

Cumulative Effects

Alternative 2 harvest activities, road-building, herbicide treatments and prescribed burning will create some patches of brushy habitat that will benefit the black bear by providing green leafy material, grubs, insects, and later, berries and other soft mast; the brushy areas will benefit the black bear while the early successional stage persists: 10 to 15 years for the harvested areas, and as long as the permanent openings are maintained. The acres of mature forest (**91**%) that will remain in the project area will provide mast (acorns, hickory nuts, etc) that will benefit black bears in the fall and winter.

Alternative 1 is the "no action" alternative, and forest processes would occur naturally. There will be little early successional habitat for the black bear's foraging, so that may be a cumulative effect for the black bear.

Based on the results of long-term monitoring data, black bear show overall increasing population trends on the GWJNFs (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species). With proposed projects such as this, combined with the maintenance of over 80% of forested acres in mature forest condition, the GWJNFs should be able to provide the mosaic of forest

types and ages recommended by research for species such as black bear for its life history needs on GWJNF lands. Black bears have the abundance and distribution across the Forests that will provide for their persistence into the foreseeable future. There should be beneficial effects to the black bear and its habitat from the action alternative.

WHITE-TAILED DEER (*Odocoileus virginianus*)

White-tailed deer are generalists, using a variety of habitat types. Mature forests provide mast, brushy areas provide hiding cover and browse, and early successional areas provide browse, berries and herbaceous plants for eating. A mixture of habitat types and resulting edge insures that an abundant food source is available throughout the year. White-tailed deer heavily use hard mast in the fall (usually acorns) and accumulate sustaining fat reserves for the winter.

Direct and Indirect Effects

Alternative 2 proposes thinning treatments, regeneration treatments, road-building, herbicide treatments, and prescribed burning. The thinning treatments would create patches of early successional habitat, providing abundant food resources for white-tailed deer, and the regeneration treatments would provide 285 acres of early successional habitat. An increase in browse availability would benefit the local deer population, and any localized increases in deer populations would not be expected to create problems for adjacent private landowners given the hunting pressures on public lands. Good acorn crops usually mean higher reproductive rates and better antler development for deer. Even with tree harvest, hard mast (acorn) production would be expected to increase through time, given treatments which would increase mast production: the thinning would remove competition for the oak trees, and the remaining mature forest in the project area (**91**%) would continue to provide hard mast for the white-tailed deer. The use of prescribed fire would enhance oak establishment for the future due to the "knocking-back" or killing of fire-intolerant plant species from the project area. Oak species are fire-tolerant. Herbicide treatments are spot treatments to remove competing vegetation. Construction of roads, temporary roads and openings should have no direct effect on the white-tailed deer since there would be a vast majority of the mature forest remaining, and the openings present foraging opportunities. Skid trails should have no effect on the white-tailed deer since they are not constructed and are temporary. There should be beneficial effects to the white-tailed deer from these activities.

Alternative 1 (the no-action alternative) will result in no loss of existing mature forest, but will provide a very limited amount of suitable early successional habitat for use by white-tailed deer, as would be expected with natural forest processes.

Cumulative Effects

Alternative 2 harvest activities will create some patches of brushy habitat that will benefit the white-tailed deer by providing green leafy material, browse, and cover. The acres of mature forest (**91**%) that will remain in the project area will provide hard mast (acorns, hickory nuts, etc) that will benefit white-tailed deer in the fall and winter. There should be no effects to the white-tailed deer from the herbicide treatments; removal of the non-native plant species will benefit the white-tailed deer by enhancing the natural diversity of the project area, and removal of the undesirable vegetation will enhance mast-tree growth and eventual mast production. Prescribed

burning will have a beneficial effect for the white-tailed deer by creating patches of early successional habitat; the overall improvement to habitat in the following years should benefit the white-tailed deer. Overall, the harvest, herbicide treatments and prescribed burning should have beneficial cumulative effects for the white-tailed deer. Road construction should have no cumulative effect on the white-tailed deer since early successional habitat will be created and will remain along road edges, providing foraging opportunities.

Alternative 1 is the "no action" alternative, and forest processes would occur naturally. There will be little early successional habitat for the white-tailed deer's foraging and cover, so the cumulative effect for the white-tailed deer may be a reduction in numbers.

Based on the results of long-term monitoring data, white-tailed deer populations show overall stable trends on the GWJNFs and increasing trends state-wide (George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species). With proposed projects such as this, combined with the maintenance of over 80% of forested acres in mature forest condition, the GWJNFs should be able to provide the mosaic of forest types and ages recommended by research for species such as white-tailed deer for its life history needs on GWJN lands. White-tailed deer have the abundance and distribution across the Forests that will provide for their persistence into the foreseeable future. There should be beneficial cumulative effects for the white-tailed deer with the proposed action.

3.3.3 Geology

There are no issues pertaining to geology identified during the scoping process. The interdisciplinary team did consider the impacts of harvesting and the possible effects on slope stability and received input and analysis from Tom Collins, the Forest Geologist.

The conclusion of this analysis determined that appropriate placement of logging infrastructure would not appreciably increase the potential for landslides, mast wasting, or debris flow. As a result, this issue was dropped from detailed analysis.

3.3.4 Soils

The report "Soil Resource Report for the Existing Conditions and the Estimated Effects for this Proposed Project", written by Tom Bailey, Forest Soil Scientist, is incorporated by reference and is located in the project file. The results of a detailed soil survey are displayed on maps available at the Forest Supervisor's Office in Roanoke, VA, and are incorporated by reference.

Direct and Indirect Effects

No issues directly related to soil resources were identified during scoping. Table 13 shows the direct and indirect; and short and long term effects, while Table 14 shows the percentage of the project area affected in short and long term. Although soils can indirectly affect water and aquatic resources, mitigation measures (Chapter 2.4), Forest Plan Standards, and VA BMP's, reduce this potential to well within the range of natural variability (see hydrology section and write-up in project file), and therefore will have no significant effect. System road construction proposed in Alternative 1 is not considered in the impacts since this road will be part of the Forest Road system and will not be expected to grow biomass in the

future. Effects to soil productivity from permanent road building are not a concern. Erosion/sediment effects from this work are considered in the hydrology section of this environmental assessment. Erosion and sediment control seeding and structures will be applied to minimize soil movement.

ALTERNATIVE 2

TABLE 15: Estimated Acreage of Short and Long Term Effects to Soil Productivity for alt. 2
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ACTIVITY	SHORT TERM	LONG TERM	TOTAL
Bladed Skid Roads (10 mi)	9.7 acres	14.5 acres	24.2 acres
Primary Skid Trails (3.3 mi)	4 acres	0	4 acres
Log Landings (25 @ 0.25ac.)	3.3 acres	3.3 acres	6.6 acres
Fire line construction hand	5.3 acres	0	5.3 acres
Temporary Road Construction	2.7 acres	3.6 acres	6.3 acres
Totals	**25 acres**	**21.4 acres**	**46.4 acres**

Assumptions used for above table:

1. Bladed Skid roads have 12 feet of travel way and 20 feet cleared right-of-way and are 75% of total skid roads and trails.
2. Primary skid trails are 25% of total skid roads and trails and 10 feet wide, unbladed and a short term impact.
3. Log landings are .25 acre each and 50% has reduction in soil productivity due to blading and compaction.
4. Hand tool construction of fire line is a short term impact to soil productivity due to the shallow depth of disturbance hand line is 5 feet wide plus 2 feet of spoil.
5. Temporary road has 35 feet of cleared right-of-way with 20 feet of travel way, including a cut slope. Temporary road has long-term effect on 20 feet of the cleared right of way.

Short-term impacts would occur on approximately 25 acres with Alternative 2. Long-term impacts would occur on approximately 21.4 acres with Alternative 2.

To put the magnitude of these impacts into perspective, the estimated acres impacted by Alternative 2 are compared to the total acres in the activity areas in table 15 above. This will show the percentage of the activity area impacted by the proposed activities for the alternatives. First, the activity area will be computed as follows:

- Acres treated by commercial timber harvest outside the prescribed burn treatment = 88
- Acres of the prescribed burn treatment = 2900

The activity area for Alternative 2 is 2994 acres. This will include all areas proposed for treatment.

TABLE 16: Estimated Acreage of the Activity Area Soils Affected by the Alternatives.

Alternative	Extent of Activity Area (acres)	Percent of the Activity Area		Percent of Activity Area Affected Long Term
		Short term	**Long term**	
Alternative 2	2994	25 acres	21.4 acres	<1%

Table 16 above shows that the proposed alternative would affect a small part of the overall activity area of proposed alternative 2 and that much of the impact would be short term.

Cumulative Effects

Based on knowledge of these treatment areas the proposed actions of Alternative 2 when combined with past and future proposed actions for these treatment areas are not expected to cause a significant reduction in soil productivity for these areas. No future treatments are planned for these areas that would impact soil productivity and effects to soil productivity from past actions in these 2994 acres.

3.3.5 Vegetation

Issue(s) Related to this Resource

No issues directly related to vegetation were identified during scoping

Existing Condition

Table 2 (page 7) *Project Area Age-Class Distribution*, displays the current age class distribution for the project area and contiguous 8A1. This table shows the lack of early and mid-successional age classes within the project area and contiguous 8A prescription area. This lack of spatial heterogeneity as well as a lack of vertical vegetative diversity are primary purposes and needs for implementation of this project.

Direct, Indirect, and Cumulative Effects of the Alternatives

Age-Class Distribution

Vegetation treatments can change stand ages in several ways. A stand regenerated through timber harvest becomes 0 (in the 0 to 10 year age class) upon completion of harvesting and site preparation activities. This is the case even if some overstory trees remain. Age-class for intermediate treatments, including thinning and crown touching release, might change depending on the residual stand composition. For this analysis, stand ages remain the same for all intermediate treatments. Prescribed burning may kill some overstory trees but, in general, does not create much ESH. So stand regeneration through commercial timber harvest is the most logical way to create ESH for those species that depend on it.

One important concept to remember is that stand ages are not static. Rather they change every year and in order to keep a balanced age class distribution stand entries must be made every ten years at a minimum in order to stay in compliance with the forest plan (pg 3-112 RLMP).

Alternative 1 (No Action) – This alternative plans no timber harvest or associated activities within the Project area. Because no management activities are planned, there would be no direct effect on age-class distribution, either spatially or temporally, there would be no stands in the 0-10 age-class created unless stand replacing events occur, such as mortality induced by insects, diseases, wildfire or extreme wind events.

This alternative would not create ESH as directed in the Forest Plan, either directly or indirectly. Rather, the project area would move further away from this goal, unless a natural stand replacing event occurred.

Alternative 2 – The action alternative includes regeneration treatments, intermediate harvest, road and landing construction, project area access control, and associated post-harvest activities including prescribed burning, and chainsaw site preparation. This alternative would create ESH in the project area and help to increase vertical vegetative diversity.

Regeneration Harvest: Regeneration after harvest will likely occur from a combination of stump sprouting and direct seeding. A combination of oaks, yellow poplar, red maple, hickory, and other hardwoods would occupy the site. On the drier ridge tops and south/west facing aspects, the oaks will compete well with other species trending towards oak/hickory stands; in more mesic coves, yellow poplar will compete favorably against the oaks, trending towards cove hardwoods. Previous harvest units on similar forest types and sites have all naturally regenerated within 5 years of harvest. Based on this anecdotal evidence, and the potential for stump sprouting and seed source potential, stands regenerated usually achieve full stocking within 5 years.

Since very little (approx. 18 acres) harvest is planned in stands greater than 100 years old the management prescription area will continue to move towards meeting the 8A1-OBJ2 for stands in the 100+ age group. Given the large land base and the current levels of cutting this objective will be more easily met in the future than the early and mid-successional objectives.

Stand Improvement Harvest: The stand improvement harvest proposed in Alternative 2 is designed to improve species composition, stocking levels, and overall tree vigor. The percentage of desirable species in the project area would increase as the percentage of non-desirable and non-native species is reduced through harvest. The improvement harvest would also increase growing space for mast producing trees, which should provide for larger crown sizes, increased vigor, and the potential for increased mast production. Improvement harvests also increase the amount of advanced regeneration present in the understory of treated stands, therefore setting the stage for the successful future regeneration harvests that will be needed to maintain acreage in the 0-10 year age class. Increased herbaceous growth is also a benefit of the stand improvement harvest. Stand improvement harvest will have no direct, indirect or cumulative effect to age-class distribution in the project area.

Prescribed Fire: Prescribed fire will have no effect on the age class distribution, although, some mortality will occur in understory trees. Mortality has occurred in small patches immediately following prescribed burns already conducted in the area however these small (generally less than an acre or two) patches do not significantly contribute to ESH given the context of the entire project area. Some of the results we expect from prescribed burns include a release of nutrients that cause a flush of growth, increasing understory herbaceous species, and improvement in species composition (mainly due to an increased percentage of oak).

It is likely that additional cavity trees would be created from fire scars, excess fuels would be removed from the forest floor, and the percentage of thin-barked species such as red maple and magnolia would be reduced. It is also possible that some fire dependent species such as the southern yellow pine and woody shrub growth (notably absent in the project area stands today) will begin to seed in and take hold. Prescribed burning should have no direct, indirect, or cumulative effect to age-class distribution, overstory species composition, overall forest health, or noxious weeds in the project area.

3.4 Social Components

3.4.1 Visuals and Scenery Management

Issue # 2: Management activities adjacent to Lake Keokee could significantly impact the visual quality of the viewshed.

Indicator – Management activities meet the scenic class objectives for the project area

Scope of the Analysis

The geographic bounds for this scenic analysis will include the area visible from the identified viewing points surrounding the Wells Branch area. The primary viewing point is Lake Keokee. Each unit was evaluated from vantage points with high concern to eliminate obtrusive edges, shapes, patterns in conjunction with the shape and density of each unit.

The time periods for this analysis will include projects occurring up to 10 years in the past and into the future. This time period is based on the concept that the greatest harvesting impacts on visuals generally last about 10 years at which time the treated units are not as easily discernible to the casual observer.

3.4.1.1 Affected Environment

Existing Situation

The project area is managed to provide roaded natural recreational opportunities. Thus, the area is not remote. Visitors are expected to experience comfort and security but feelings of solitude, challenge, and risk are to be expected. During most of the year, occasional encounters with other forest visitors can be expected. Recreational activities that occur within the project area are primarily dispersed in nature, but concentrated use does occur at the Keokee Lake picnic and boat launch area.

Scenic Integrity Objectives (SIO) is a system of classification describing the scenic objectives or value of a particular landscape or portions of that landscape. Values in this classification system range from very high to low. There are no very high SIO in the project area. There is a substantial amount of high SIO surrounding Lake Keokee. High SIO areas should appear "unaltered" when viewed from a distance (RLRMP pg 2-47). However this does not preclude timber harvest (including regeneration harvests). FW-187 states that "in seed-tree and shelterwood methods, in High and Moderate SIO areas, delay removal of overstory until understory is 10 feet or more in height" (RLRMP pg. 2-48).

There are three regeneration units (or portions of units) proposed in the high SIO areas (stands 2090-1, 2090-19, 2089-10). These high SIO areas are 3, 19, and 34 acres respectively (56 acres total). A shelterwood harvest is proposed for these areas. When viewed from a distance (from Lake Keokee in this case) shelterwood harvests appear unaltered. The largest area (2089-10) is behind a ridge and will not be visible from the lake at all. In addition to the silvicultural system

used a number of other mitigations will be implemented to reduce the visual impact from proposed harvests. Many of these standards are listed on page 2-48 of the RLRMP.

3.4.1.2 Environmental Effects

Direct and Indirect Effects
Alternative 1 (No Action)
There would be no effect to the scenic resources in the area.

Alternative 2
Proposed Units and their effects on the Visual Resources of the Area

Stands 2090-1, 2090-19, 2089-10 have an inventoried SIO of high and have some timber harvesting proposed (stand 2090-1 only has a few acres). In order to achieve high SIO, the following actions should be taken prior to and upon completion of harvest.

- Apply leave tree and unit marking so that it is not visible within 100 feet of Keokee loop trail.
- Remove, burn, chip or lop/scatter slash to within 2 feet of the ground within 100 feet of Keokee loop trail.
- Shape and feather the edges of all units.

All Remaining Stands
All of the other stands proposed for treatment have SIO of moderate or low. These units are not visible from Lake Keokee. All actions meet the SIO of the area as adopted by the Forest Plan.

3.4.1.3 Cumulative Effects

Future Actions
All cumulative actions meet the SIO of the area. No significant cumulative impacts to the visual resource are expected to result from this action coupled with past and reasonably foreseeable actions in the viewshed.

3.4.2 Recreation

3.4.2.1 Affected Environment
Existing Situation The Recreational Opportunity Spectrum (ROS) designation for the affected area is Roaded Natural, managed to provide roaded natural recreational opportunities. The defined recreation setting includes strong evidence of designated roads and highways, feelings of solitude are not expected, and the area is not remote. Rustic structures are generally scattered. There is ample evidence of vegetation manipulation. Natural setting may be modified which range from being easily noticed to strongly dominant.

There are currently many different types of recreation occurring over the project area. Fishing and hunting are probably the most prevalent activities, but hiking, backpacking, wildlife watching, and picnicking are also common.

3.4.2.2 Environmental Effects

Direct and Indirect Effects
Alternative 1 (No Action)
There would be no effect to the recreation resources in the area.

Alternative 2
All the traditional recreational uses of the area would continue. Several of the proposed activities could have a positive effect on Recreation. The silvicultural treatments would improve grouse, rabbit, and deer habitat and improve hunting and wildlife viewing opportunities for those game species. Road construction would provide for easier access to remote areas, but lessen the opportunity for feelings of solitude. In addition, new permanent wildlife openings have the potential to increase early successional wildlife populations and wildlife viewing and hunting opportunities for game species. Trail closures may temporarily impede recreational activities during harvesting operations, but will be short term and will likely include improvements to some sections of eroded and overgrown trail tread that lie within or very close to cutting units. Blazes and signage will also be replaced/improved during the proposed management activities.

3.4.2.3 Cumulative Effects
Future Actions
All cumulative actions meet the ROS of the area. No significant cumulative impacts to the recreational resource are expected to result from this action coupled with past and reasonably foreseeable actions in the project area.

3.4.3 Heritage Resources
Cultural Resource surveys were completed under the direction of Forest Archeologist Mike Madden. The results of his findings and concurrence from SHPO indicated that no Cultural Resources were located in the project area. As a result, no significant issues related to Cultural Resources were identified. Any cultural resources found after the start of harvesting will be assessed, and protected according to the recommendations of the Forest Archeologist.

3.4.4 Transportation / Access
The report "Roads Analysis for the Wells Branch Project Area", dated August, 2010, is incorporated by reference. The conclusions of the roads analysis determined the need for pre-haul maintenance on existing system roads, and no opportunities to decommission existing roads.

No significant issues related to transportation were identified during the scoping process, although, road construction can have an effect on various resource areas. The impacts of system road reconstruction on the issues (water quality and riparian communities, and TES / MIS

species, relating to sedimentation and karst areas, and water yield) have been analyzed, the results of which are incorporated in this chapter of the Wells Branch Timber Sale EA. The effects of road reconstruction on other resources areas can be found in the project file under the associated resource.

3.4.5 Minerals and Gas Wells

There are no gas wells in the Wells Branch Project area. No issues pertaining to gas wells were raised as a result of the scoping process.

3.5 Economic Components

A basic economic principle related to ecosystem management is to 'use resources wisely and efficiently to improve economic prosperity' of the communities, regions and the nation by cost-effective production of natural resources such as wood, fiber, water, minerals, energy, livestock forage, and recreation opportunities. No issues related to economics were identified during the scoping process. For economics resources, the area of potential effects is limited to the Wells Branch Project Area, and the products produced thereon.

A detailed Report titled 'Wells Branch Economic Analysis' was completed by Tyler Williamson, District TMA, and is incorporated by reference. This report discusses the estimated costs and revenues associated with this project as well as the alternatives with the highest PNV and B/C ratio.

Issue(s) Related to this Resource:

None.

Scope of the Analysis:

The scope of the economic analysis is limited to a comparison of the expenditures and revenues associated with the commercial timber sale component of the project, as well as an estimation of the cost associated with implementing the other vegetative treatments in each alternative. The cost of analyzing the no action alternative is also considered. It is important to note that not all effects can be quantified monetarily. It is difficult to reduce the benefits and costs of a proposed management action on wildlife, soil, water, visuals, recreation or other non-market resources to a single dollar amount. There is no single accepted methodology for such an evaluation, and it is considered beyond the scope of this analysis. The environmental effects of the alternatives on these resources are described and disclosed in the previous sections of this chapter.

Existing Condition:

Demand for hardwood sawtimber continues to be stable. Markets for small roundwood are strong, and the proximity of the project area to a pulpmill would ensure a good outlet for this product. Unit costs used in this analysis are based on costs derived from the FY 2011 budget allocation process; timber revenues are based on appraisal base period prices and returns from sales for the 4th quarter of FY 2011.

Direct, Indirect and Cumulative Effects
Alternative 1 has no direct, indirect or cumulative effects. There would be no direct economic costs or benefits resulting from the implementation of this alternative.

Alternative 2: Tables 17 and 18 provide information regarding estimated costs and benefits associated with each alternative. This alternative proposes regeneration harvest on approximately 285 acres and thinning on approximately 176 acres of the project area.

Benefits: The approximate economic (cash) benefits that occur from the implementation of this project arise from the sale of forest products, including the sawtimber and pulpwood.

Costs: The approximate costs (cash) that occur from the implementation of this project include the harvesting of the project area, sale preparation and administration, road work, and the implementation of any sale area improvement projects associated with the action alternative.

	Alternative 1	Alternative 2
Costs	$ 0	$ -382,418.96
Revenue	$ 0	$ 535,595.15
B/C Ratio	0	1.4
PNV	$ 0	$ 153,176.20

Table 17. Comparison by alternative of the costs, revenues, B/C Ratio, and present net value (PNV)

Summary: Alternative 2 results in a positive present net value (PNV) of approximately $153,000, meaning that the economic (cash) benefits from the project outweigh the costs for the implementation of the project.

Table 18. Approximate Net Revenue and associated Costs for Alternative 2

Acres Harvested	Estimated Volume	Estimated Stumpage Value	Prescribed Burn Costs	Estimated Road Construction Costs	Timber Sale Planning. Prep, and Sale Admin Cost	Site Prep and Exotic Species control	Adjusted Revenue
461	9,948 ccf	535,595	144,000	60,000	160,000	18,419	153,176

3.6 Climatological Factors

There were no issues identified regarding this resource: however, climate change can affect the resources in the project area and the proposed project can affect climate change through altering the carbon cycle.

Climate models are continuing to be developed and refined, but the two principal models found to best simulate future climate change conditions for the various regions across the country are the Hadley Center model and the Canadian Climate center model (climate Change impacts on the United States 2001). Both models indicate warming in the southern region of the US. However, the models differ in that one predicts little change in precipitation until 2030 followed by much drier conditions over the next 70 years. The other predicts a slight decrease in precipitation during the next 30 years followed by increased precipitation. These changes could affect forest productivity, forest pest activity, vegetation types, major weather disturbances (droughts, hurricanes), and stream flow. These effects would likely be seen across the Forest, though some sensitive areas (such as high elevation communities may be affected sooner than others.

The proposed project has no high elevation treatment units, but does have mid-level treatment units. It is not expected that the action alternatives will substantially alter the effects of climate change in the project area. The regeneration in the areas to be harvested will provide more structural diversity to the area and establish the young, vigorous stand of early successional habitat that may be more resilient and less vulnerable to the changes in climate. Under the No Action Alternative, there would be no proposed change from the current condition where currently forested stands are expected to be less resilient to possible climate change impacts. Changes in productivity or insect and disease impacts are likely to be more extreme with older, established growth compared to the action alternatives.

The proposed action and alternatives will alter the carbon cycle in that it affects the carbon stock in any one of the pools. Each of the action alternatives will remove biomass as a result of timber harvest and prescribed burning. This will reduce the amount of carbon stored in the treated stands. A portion of the carbon removed will remain stored for a period of time in wood products.

The action alternative affects greenhouse gases. The associated prescribed burn will release carbon into the atmosphere through the chemical reactions of fire. The accelerated decomposition will also generate carbon emissions. However, overall forestry practices (including the accelerated overall growth initiated by harvesting and prescribed burning) have been shown to act as a net carbon sink (EPA 2001).

There will be a direct, short term increase in carbon emissions during prescribed burns and a short term increase due to an increase in dead vegetation following the burn. However the short term loss of biomass resulting from a fire may be offset by the burned area's increased ability to produce herbaceous biomass. There is a direct beneficial effect on climate change of decreased greenhouse gas emission from the acres to be burned because the risk of acres being burned by uncharacteristically severe wildfires would be reduced. There is also an indirect beneficial effect by treating these acres because live stands of trees will retain higher capacity to sequester carbon dioxide compared to stands killed by uncharacteristically severe wildfires, especially if not immediately reforested.

Regeneration harvests will reduce existing carbon stocks at the harvest sites. The harvest of live trees, combined with the likely increase in down, dead wood will temporarily convert stands from a carbon sink that removes more carbon from the atmosphere than it emits, to a carbon source that more carbon through respiration than it absorbs. These stands will remain a source of carbon to the atmosphere until carbon uptake by new trees and other vegetation exceeds the emissions from decomposing dead organic material. The stands will likely remain a carbon source for several years, and perhaps for more than a decade depending on the amount of dead biomass left on the site, the length of time before new trees become reestablished, and their rate of growth once reestablished. As the stands continue to develop, the strength of the carbon sink will increase until peaking at an intermediate age and then gradually decline but remain positive. Similarly, once new trees are established, carbon stocks will accumulate rapidly for several decades. The rate of accumulation will slow as the stands age. Carbon stocks will continue to accumulate, although at a declining rate, until impacted by future disturbances.

Recent scientific literature confirms this general pattern of changes in net ecosystem productivity (NEP) and carbon stocks over the period of forest stand development. Most mature and old stand remained a net sink of carbon. Pregitzer and Euskirchen (2004) synthesized results from 120 separate studies of carbon stocks and carbon fluxes boreal, temperate, and tropical biomes. They found that in temperate forests NEP is lowest, and most variable, in young stands (0-30 years), highest in stands 31-70 years, and declines thereafter as stands age. These studies also reveal a general pattern of total carbon stocks declining after disturbance and then increasing, rapidly during intermediate years and then at a declining rate, over time until another significant disturbance (timber harvest or tree mortality resulting from drought, fire, insects, disease or other causes) kills large numbers of trees and again converts the stands to a carbon source where carbon emissions from decay of dead biomass exceeds that amount of carbon removed from the atmosphere by photosynthesis within the stand.

The impacts of the action alternatives on global carbon sequestration and atmospheric concentrations of carbon dioxide are not significant. However, the forests of the United States significantly reduce atmospheric concentration of carbon dioxide resulting from fossil fuel emissions. The forest and wood products of the United States currently sequester approximately 200 teragrams of carbon per year (Heath and Smith, 2004). This rate of carbon sequestration offsets approximately 10% of carbon dioxide emissions from burning fossil fuels (Birdsey et al., 2006). U.S. Forests currently contain 66,600 teragrams of carbon. The short-term reduction in carbon stocks and sequestration rates resulting from the proposed project are imperceptibly small on global and national scales, as are the potential long-term benefits in terms of carbon storage.

The currently large carbon sink in U.S. forests is a result of past land use changes, including the re-growth of forest of large areas of the eastern U.S. harvested in the 19th century, and 20th century fire suppression in the western U.S. (Bidsey et al. 2006). The continuation of this large carbon sink is uncertain because some of the processes promoting the current sink are likely to decline and projected increases in disturbance rates such as fire and large-scale insect mortality may release a significant portion of existing carbon stocks (Pacala et al., 2008; Canadell et al. 2007). Management actions – such as those proposed – that improve the resilience of forests to climate-induced increases in frequency and intensity of disturbances such as fire, and utilize harvested trees for long-lived forest products and renewable energy sources may help sustain the current strength of the carbon sink I the U.S. forests (Birdsey et al., 2007).

4.0 List of Agencies, Organizations and Individuals Consulted

A. Summary of Scoping Effort

Section 1.6 on page 8 of this EA details the scoping effort for this project. In addtion to those listed individuals the US Fish and Wildlife Service was consulted and returned a letter of concurence dated March 14, 2012.

B. Forest Service Interdisciplinary Team

Team Member	Title
Terry Adams	District Fire Management Officer
Mike Madden et. al.	Forest Archaeologist
Lois Boggs	District Wildlife Biologist
Charles Lane	District Fisheries Biologist
Tyler Williamson	Team Leader: Silviculture and Timber Specialist

Tom Bailey	Forest Soils Scientist
Tom Collins	Geology
Jessica Bier	Botany
Dick Patton	Hydrology
Jorge Hersel	District Ranger
Other Specialists Consulted	
Gary Kappesser / Dick Patton	Forest Hydrologists
Mike Tripp	Engineer
Karen Overcash	Forest Planner
Dawn Kirk	Forest Fisheries Biologist
Carol Hardy-Croy	Forest Wildlife Biologist
Steve Croy	Forest Ecologist
David Skinner	NEPA and Recreation

Biological Evaluation/Biological Assessment
for
Threatened, Endangered, and Sensitive (TES) Species
Wells Branch Vegetation Management Project
Lee County, Virginia

Clinch Ranger District
George Washington and Jefferson National Forests

Introduction

Forest Service Manual (FSM) Section 2672.41 requires a biological evaluation (BE) and/or biological assessment (BA) for all Forest Service planned, funded, executed, or permitted programs and activities. The objectives of this BE/BA are to: 1) ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native species or contribute to trends toward federal listing, 2) comply with the requirements of the Endangered Species Act (ESA) so that federal agencies do not jeopardize or adversely modify critical habitat (as defined in ESA) of federally listed species, and 3) provide a process and standard to ensure that threatened, endangered, proposed, and sensitive species receive full consideration in the decision-making process using the best available science.

The Clinch Ranger District supports known occurrences and suitable habitat for several TES species, all of which were considered in this analysis. This BE/BA documents the analysis of potential impacts of the proposed project to TES species and associated habitat. It also serves as biological input into the environmental analysis for project-level decision-making to ensure compliance with the ESA, National Environmental Policy Act (NEPA), and National Forest Management Act (NFMA).

Project Area and Cumulative Effects Analysis Area

The proposed action is to harvest timber in the vicinity of Lake Keokee: the approximate location is to the south of Craborchard Creek, west of Laurel Fork of Pigeon Creek, and north of the ridge of Stone Mountain near Olinger Gap in Lee County. Also proposed are approximately **2900** acres of prescribed burning and spot-treatment of invasive species with approved herbicides.

The geographic scope of this biological analysis for terrestrial plants and animals is the project area. The geographic scope of the analysis for the Indiana bat is the entire George Washington and Jefferson National Forests (GWJNF). Hydrologic analysis was conducted for the Proposed Action and is documented in the EA for this project. Because the streams in the project area flow in two different directions and empty into widely separated river systems, multiple cumulative

effects boundaries will need to be set for this project. For effects from the management actions planned in the Wells Branch, North Fork of the Powell, and the Craborchard Creek Tributary, the Cumulative Effects Boundary is set as the confluence of Craborchard Creek with the North Fork of the Powell River. For the management actions planned in Laurel Fork, the Cumulative Effects Boundary is set as the confluence of Laurel Fork with Pigeon Creek. Beyond these points, the effects are immeasurable and indistinguishable from background levels.
Part of the project area is in the Reeds Creek – North Fork of the Powell River 6th level HUC watershed under the Mussel and Fish Conservation Plan.

Past Actions

The agency planned prescribed fires within the proposed timber harvest area that were part of previous decisions. These prescribed burns were analyzed and implemented as follows:

- "Biological Evaluation/Biological Assessment for Threatened, Endangered, and Sensitive (TES) Species for the Wells Branch, Back Valley, and Pine Orchard Branch Prescribed Burn Units in Wise, Lee, and Scott Counties, Virginia" dated August 31, 2006, and implemented in April 2007 and March 2009;
- "Biological Evaluation/Biological Assessment for Threatened, Endangered, and Sensitive (TES) Species for the Glades, High Knob, Harvey, Machine Creek, Keokee and Mountain Fork Prescribed Burns" dated December 9, 2005, and a Decision Memo dated December 21, 2005, and implemented April 2006; and
- "Biological Evaluation/Biological Assessment for Threatened, Endangered, and Sensitive (TES) Species for the Machine Creek, Keokee, Low Place Branch, and Bear Rock Prescribed Burn Units in Wise, Lee, and Scott Counties" Virginia dated February 11, 2005 and implemented March 2005 and April 2006.

Cumulative effects from these past actions will be considered with those of the proposed action in the cumulative effects discussion below.

Proposed Management Actions

The Clinch Ranger District is proposing the following management actions:

- Harvest approximately 285 acres with even-aged management: of this total, 85 acres with shelterwood cuts and 200 acres with a treatment called coppice with reserves.
- Thin approximately 176 acres through scattered canopy gap creation (commercial thinning) to improve crown development and favor desirable crop trees.
- Non-native, invasive weed and tree species in the project area would be spot-treated with approved herbicides.
- Approximately 1.1 miles of system road, approximately 1.2 miles of temporary road, 13.3 miles of skid trails, and approximately 12.5 acres of landings will be constructed.
- Prescribed burning is proposed on approximately 2900 acres to treat slash and woody fuels in regenerated stands and site preparation for natural regeneration to enhance oak and other mast producing trees. Other objectives would include reduction of fuels, to begin the process of changing the fire regime condition class, and to promote herbaceous growth in the understory. Multiple entries of prescribed fire will be needed to accomplish the prescribed burning objectives.

Additional post-harvest actions include:

- Seeding all landings, temporary roads, and some skid roads with a quality wildlife mix to create approximately 20 acres of wildlife openings/strips.
- Performing mechanical (chainsaw) stand improvement and mid-story treatment on areas that are commercially thinned.
- Performing mechanical (chainsaw) site preparation on areas that are regenerated through coppice.

The project was designed knowing the area is potential habitat for the Indiana bat and that Forest Plan standards for its management will be followed.

Future Actions

The proposed prescribed burning will be repeated within the five years following implementation. Cumulative effects from that action and the proposed action to each species are discussed below. The agency knows of no other activities planned within the cumulative effects boundaries of the watersheds discussed in this BE/BA. Activities on private land within these watersheds are expected to remain the same for the next 10 years. Other than the proposed actions, there are no new foreseeable future projects planned on National Forest System (NFS) land within the project area at this time that may have an effect on terrestrial plants and animals. On-going projects include maintenance of roads, trails, and existing wildlife openings.

Species Reviewed

Federally listed threatened and endangered species, species proposed for federal listing, and Southern Region sensitive species (TES) that may potentially be impacted by this project were examined using the following existing available information:

1. Reviewing the list of TES plant and animal species known, or likely to occur, on the George Washington and Jefferson National Forests, and their habitat preferences. This review included the current list of federal endangered, threatened, and proposed species for the Forest concurred with by the U.S. Fish & Wildlife Service on January 4, 2007, and the August 7, 2001 Southern Region Sensitive Species list, revised for known or possible Forest occurrences on March 4, 2004, with Forest-specific updates current as of August 6, 2007 (list attached as Appendix A).

2. Consulting element occurrence records (EOR's) for TES species as maintained by the Virginia Division of Natural Heritage (VDNH), and supplied to the Forest.

3. Consulting species information, including county occurrence records, as maintained in the online database (http://www.vafwis.org/wis/asp/default.asp) titled Virginia Fish and Wildlife Information Service (VAFWIS) of the Virginia Department of Game and Inland Fisheries (VDGIF).

4. Consulting with individuals in the private and public sector who are knowledgeable about the area and its flora and/or fauna.

5. Reviewing sources listed in the reference portion of this report.

6. Reviewing the results of past field surveys that may have been conducted in the area.

Most TES species known to occur on the Forest have unique habitat requirements, such as shale barrens, rock outcrops, bogs, caves, and natural ponds. Information gathered, analyzed, and presented in the Southern Appalachian Assessment dated July 1996 states that approximately 84% of threatened and endangered species and 74% of sensitive species are associated with rare or unique habitats, often referred to as rare communities.

Through cooperative agreements between the Forest and VDNH and WVNHP, Special Biological Areas have been identified and delineated on the Forest. These include rare and significant natural communities and vegetative types. These areas reflect current knowledge of the location, management, and protection needs of rare species and associated significant natural communities on the Forest. These areas are identified in the 2004 Jefferson National Forest Revised Forest Plan (Plan), pages 3-27 through 3-30, as Botanical and Zoological Areas (Management Area 4D). There is a Management Area 4D within the project area. A discussion of the effects to the 4D prescription area follows below.

No timber harvest or ground disturbance is proposed for the Management Area 4D other than maintenance of existing system roads. The area has been extensively surveyed for additional occurrences of the small whorled pogonia, and none have been located. Herbicide treatments will be hand-applied along the road and should not affect the interior habitat in this prescription. Lighter leaf litter loads and more open canopies created by prescribed burning could benefit the small whorled pogonia in the absence of ground disturbance. There should be no net negative effect to the Management Area 4D for the small whorled pogonia from the proposed actions.

The need to conduct site-specific surveys of TES species for this project was assessed. Based on this assessment, affected potential habitat in the project area was surveyed for TES species. Appendix A of this document lists all 190 TES species currently known, or expected to occur, on or near the George Washington and Jefferson National Forests. All species on the list were considered during the analysis for this project.

A "step down" process was followed to eliminate species from further analysis and focus on those species that may be affected by proposed project activities. Species not eliminated are then analyzed in greater detail. Results of this "step down" analysis process are displayed in the Occurrence Analysis Results (OAR) column of the table in Appendix A. First, the range of a species was considered. Species' ranges on the Forest are based on county records contained in such documents as the "Atlas of the Virginia Flora", but are refined further when additional information is available, such as more recent occurrences documented in scientific literature or in Natural Heritage databases. Many times range information clearly indicates a species will not occur in the project area due to the restricted geographic distribution of most TES species. When the project area is outside a known species range, that species is eliminated from further consideration by being coded as OAR code "1" in the Appendix A table. For this project, 134 species were eliminated from further consideration because the project area is not within the species known range.

For the remaining species, after this first step, results from past surveys and knowledge of the areas and potential for suitable habitat were considered.

Field Surveys and Results

Some species could not be eliminated from further consideration based on known range. Botanical surveys of the areas were conducted in the growing seasons of 2004, 2005, 2006, and 2007 by Jessica Bier, District Biological Sciences Technician (Botany) and Candace Justice (Clinch Ranger District Wildlife Intern). Additional surveys specific for the small-whorled pogonia (*Isotria medeoloides*) were conducted in June, 2010 and June 2011 by Jessica Bier and Lois Boggs (Clinch Ranger District Wildlife Biologist). Wildlife habitat surveys were conducted in the proposed project area in 1999, 2002, 2007 by Lois Boggs (Wildlife Biologist), Chris

Owens and Brandon Sluss (Clinch Ranger District Biological Sciences Technicians), and Nicole Sorrell, Randi Wiele, Angela Burkhart, Susie Kacenas, Jose Velazco (Clinch Ranger District Wildlife Interns).

The field surveys did not sample every acre, but were distributed throughout all habitat types found in the project area. The survey method consisted of walking through the project area searching for different habitat types and TES species occurrences. The animal survey consisted of searching for individuals, signs of their presence (such as scat, tracks, calls, or nests), and/or potential habitat. The plant survey utilized meander search methodologies (Goff, Dawson, and Rochow, 1982) in which new habitat variations or unique areas are constantly being searched for, in order to maximize floristic variation. Additional surveys specific for the small whorled pogonia were requested by the USFWS (see attached map). These surveys also utilized the meander method and were conducted in areas of proposed ground disturbance in the season when small whorled pogonia should be present.

From the field surveys and knowledge of the area, species were eliminated from further consideration because of: a) lack of suitable habitat in the project area (OAR code "2"); b) habitat present and the species has been searched for, but has not been found (OAR code "3"); c) species occurs in the project area, but out of the actual area of activity (OAR code "4"); and d) aquatic species or habitat known or suspected downstream of project or activity area but outside of identified geographic bounds of water resource cumulative effects analysis area (defined as the point below which sediment amounts are immeasurable and insignificant) (OAR code "7"). The results of the field surveys are documented in Appendix A. For this project, 49 species were eliminated from further consideration because of one of the above reasons.

Species Identified as Being In the Action Area or Potentially Affected by the Action

From past field surveys and knowledge of the area, and given the proposed action, those species which are analyzed and discussed further in this document are those that: a) are found to be located in the activity area (OAR code "5"); b) were not seen during the survey(s), but possibly occur in the activity area based on habitat observed during the survey(s) or field survey was not conducted when species is recognizable (OAR code "6"); c) for aquatic species, they are known or suspected downstream of project or activity area and within identified geographic bounds of water resource cumulative effects analysis area (OAR code "8") and d) Federally listed mussel and/or fish species known in 6th level watershed of project area. Conservation measures from USFWS/FS Conservation Plan applied (OAR code 9).

As a result of this process, the 6 following species are known to occur in or near the area or are potentially impacted by the proposed action and are coded OAR 5 or 6:

OAR Code	Scientific Name	Common Name	TES
6	*Myotis sodalis*	Indiana bat	Endangered
6	*Myotis leibii*	eastern small-footed bat	Sensitive
6	*Speyeria diana*	Diana fritillary	Sensitive
6	*Cicindela patruela*	barrens tiger beetle	Sensitive
5	*Monotropsis odorata*	sweet pinesap	Sensitive
5	*Cleistes bifaria*	small spreading pogonia	Sensitive

The George Washington and Jefferson National Forest (GWJNF) has developed a conservation plan for federally listed mussel and fish species that have potential to be affected by our activities. The Conservation Plan includes life history information, threats, conservation needs, and specific measures. This Plan is the result of close work with the US Fish and Wildlife Service (USFWS) over a two-year period.

Craborchard Creek, Wells Branch, and Roberts Hollow are within the Reeds Creek – Powell River 6th level HUC watershed (060102060202) covered by the MFCP. Effects to the Federally Threatened blackside dace *Phoxinus cumberlandensis* will be discussed below in the "Effects to Species Covered by the MFCP" section of this document.

Other than the 7 species coded OAR 4, 5, 6, or 9, no other TES species or associated potential habitat was seen during past field surveys or considered to exist within the project area.

Effects of Proposed Management Action on Each Identified Species

The analysis of possible effects to species identified as known or expected to occur in the vicinity of the proposed project, or likely to be impacted by the action includes the following existing information:

1. Data on species/habitat relationships.
2. Species range distribution.
3. Occurrences developed from past field surveys or field observations.
4. The amount, condition, and distribution of suitable habitat.

Effects to Endangered Species

Direct, Indirect and Cumulative Effects to Indiana Bat

Effects to the federally endangered Indiana bat (*Myotis sodalis*) were considered in this BE/BA because it is assumed the entire Forest is potential habitat for this species. See USFWS's Biological Opinion (BO) of January 13, 2004 and the 2004 Revised Land and Resource Management Plan for the Jefferson National Forest.

During past and recent surveys, no Indiana bats were seen even though potential habitat (mature forests with trees having exfoliating bark) exists in all the proposed project areas. The project areas contain tree species of the size and type known to be used by the Indiana bat. Based upon professional judgment and known cave surveys, there are no caves with winter microclimate habitat conditions suitable for Indiana bats in the project areas. The nearest cave with documented Indiana bat use is approximately 11.5 miles to the east in Wise County, Virginia.

As stated in the BO and Forest Plan, the retention of some snags, shagbark hickory, and hollow trees (as available) in this sale area would allow potential Indiana bat roost sites to be maintained. Decreasing canopy closure in the harvest units would increase the degree of exposure of some potential maternity roost trees to solar radiation, providing improved thermal conditions for raising young during a wide range of weather conditions. Harvest units would create insect-rich foraging areas and flight corridors leading to any potential roost tree. Harvesting would produce a mosaic of regeneration areas intermixed with mature and late successional forests. This will indirectly provide feeding areas since bats are known to forage

within the canopy openings of upland forests, over clearings with early successional vegetation, along the borders of croplands or wooded strips (fencerows), and over ponds. On the other hand, negative impacts to the Indiana bat would be: (a) the slight chance that individuals or small groups of roosting bats (including summer maternity colonies) may be unintentionally killed by the felling of trees harboring undetected roosts (e.g. dead limbs with loose bark, or small cavities in the boles), or by the accidental felling of occupied snags or damaged or hollow trees during timber harvest or other activities; and (b) a short-term reduction in the total amount of foraging habitat available to individual Indiana bats which would be the temporary result of regeneration cuts. Although the likelihood is very low, this project could result in the inadvertent loss of individual Indiana bats or small groups of Indiana bats, by the removal of some large-diameter hardwood trees occupied by bats during the period from approximately April 1 to October 15.

The George Washington and Jefferson National Forests currently burn approximately 12,000 to 20,000 acres under prescribed conditions, primarily during the winter and spring months, for ecosystem restoration and maintenance, wildlife and rare species management, site preparation, and oak/pine regeneration. An increase in the prescribed burn program is ongoing and should increase over the next several years to 20,000 to 25,000 acres per year. The Biological Opinion issued by the USFWS in January 2004 states, "We also recognize that prescribed burning may improve habitat for the Indiana bat on the JNF by creating additional roost trees and open understory." The majority of these proposed burns will occur during the spring and early summer. Additional late winter or early fall burns may also occur. Control lines generally consist of existing roads, trails, and streams wherever possible. In areas where control lines need to be constructed, methods will include use of hand tools and/or bulldozer. Lines will consist of 2-5 foot wide strips dug to mineral soil and may amount to 9.5 to 10 acres/year. Some smaller trees (<9" dbh) will be felled during construction, but larger trees will usually be avoided with the line going around and between them. Some standing snags near the line will be felled when they pose a hazard to personnel or may burn and fall thus spreading fire across the line into acres not scheduled for burning.

As discussed in the Biological Opinion, prescribed burning during the summer could result in direct mortality to Indiana bats due to actually roost tree being incinerated, or by death caused by smoke inhalation. Because the majority of burns will occur during the spring and early summer, direct mortality of the Indiana bat could increase. However, existing dense overstory and understory density of vegetation inhibits free bat movement and foraging. Therefore, prescribed burning will provide restoration and maintenance of uncluttered open-understory foraging pathways for the bat, allowing them to easily reach existing and fire-killed roost trees. Increased insect populations produced in burning areas for foraging is also likely to occur in succeeding years.

During this prescribed burn project and associated activities the immediate removal of hardwood trees greater than 9" dbh is very unlikely, but if it did occur it would result in some very minor loss of potential Indiana bat roost trees, and indirectly the potential, but very unlikely, loss of individual bats. Shagbark hickory, old snags with exfoliating bark, and large hollow cavity trees will not likely be impacted due to the parameters under which the burn will be conducted. This will greatly reduce, if not eliminate these potential impacts

This project-level analysis has tiered to the Jefferson National Forest's Revised Forest and Land Resource Management Plan (Forest Plan) and Final Environmental Impact Statement (FEIS) and is in compliance with applicable Standards FW-45 to FW-60. This project-level analysis includes, and is in addition to, the entire Indiana bat effects analysis (pages 3-180 through 3-184) documented in the Forest Plan EIS. Because of its length, the Forest Plan's discussion is not repeated here. However, findings of that analysis concluded that individual bats might be killed or harmed by such activities as associated with this project. The U.S. Fish and Wildlife Service has determined that such take, within authorized levels, would be incidental take, and would not result in jeopardy to the Indiana bat. The acreage proposed here for harvest and prescribed burning represents approximately 20% of the allowable amount of habitat disturbance (estimated at up to 15,000 acres for prescribed burns and 1,800 acres for other projects for a total of 16,800 acres per year on the JNF) under the incidental take provisions of the Jefferson Plan Revision Biological Opinion. From 2004 (when the Plan was revised) through 2007, less than 8,000 acres (<48% of 16,800 acres) have been disturbed in any given year.

There is potential unoccupied roosting habitat for the Indiana bat within the project area, but with implementation of measures described in the BO under the Terms and Conditions section of the Incidental Take Statement, there will be no cumulative effects.

For the Indiana bat, this project will be in compliance with the BO issued by the USFWS on January 13, 2004 and therefore constitutes compliance with ESA Section 7 requirements. Since implementation of this project will be in compliance with, and tiers to, the BO that was issued as a result of formal consultation and it provides both specific Plan and project level direction, plus no new information has been identified as of this date, a finding of the effect to the Indiana bat for this proposed project is: no effect, beyond that which is already disclosed in the Revised Land and Resource Management Plan of January 15, 2004 and by the USFWS in the BO of January 13, 2004. Therefore, further Section 7 consultation is not necessary for the Indiana bat.

The U.S. Fish and Wildlife Service supported the determination for the Indiana bat as follows: in the January 13, 2004 U.S. Fish and Wildlife Service's Biological Opinion concerning the Indiana bat on the Forest the following conclusion was reached,

> "After reviewing the current rangewide status of the Indiana bat, the environmental baseline for the action area, the effects of forest management and other activities on the JNF as described in the 2004 Revised Land and Resource Management Plan, and the cumulative effects, it is the FWS's biological opinion that implementation of forest management and other activities authorized as specified in the Jefferson Land and Resource Management Plan are not likely to jeopardize the continued existence of the Indiana bat. Critical habitat for this species has been designated in Kentucky, Tennessee, Illinois, Missouri, and West Virginia. However, this action does not affect those areas and no destruction or adverse modification of that critical habitat will occur as a result of JNF management activities."

There are no foreseeable activities in the area that would directly affect the Indiana bat. Therefore, there will be no cumulative effects to the Indiana bat from the proposed timber

harvest, associated post-harvest projects, and prescribed burning other than the effects disclosed above.

Species Outlined in the Mussel and Fish Conservation Plan

On April 23, 2004, the GWJNF received a letter from the USFWS stating:

> "Since the standards of this Conservation Plan were incorporated into the 2004 Jefferson Land Resource Management Plan (JLRMP), further consultation on activities that may affect listed mussels and fish is not required for projects that adhere to the conservation measures in the JLRMP and this Conservation Plan."

As agreed to by the USFWS, the development and implementation of this plan covers Section 7 consultation requirements under the Endangered Species Act, and serves as informal consultation.

Since implementation of this project will be in compliance with, and tiers to, the Conservation Plan that was developed as a result of informal consultation with the USFWS and it provides specific project level direction, plus no new information has been identified as of this date, a finding of the effect to these species for this proposed project is "may affect, not likely to adversely affect." Therefore, given the project level effects analysis for these species, further Section 7 consultation is not necessary.

A discussion of the habitat needs for the species covered by the Conservation Plan are given in Appendix A of the Mussel and Fish Conservation Plan (pp 24-28, in the project file). Habitat exists for one species identified from the Mussel and Fish Conservation Plan, blackside dace *Phoxinus cumberlandensis*, beyond the cumulative effects boundary for the project. A population of this Federally Threatened minnow species was introduced to the North Fork of the Powell River and has been found from several tributaries in the Reeds Creek 6th level HUC watershed. This species is most likely found in tributaries, not the main river and the known occurrences are well downstream from the cumulative effects boundary set for this project.

All Conservation Plan mitigation measures will be applied in the implementation of this project. Therefore, there will be no measurable direct, indirect, or cumulative effects to the species covered by the Conservation Plan, other than the effects already disclosed.

Effects to Threatened Species

Small whorled pogonia (*Isotria medeoloides*)

During the step-down evaluation process, this species was coded 4, which is defined as "species occurs in project area, but outside of activity area." Normally, assigning a species a "4" would end the effects discussion of a given species in a BE/BA. In this case, the known occurrences of this species in the project area occur outside of all the activities in the proposed action, and surveys conducted in areas of proposed disturbance over several summers did not turn up any new occurrences. While the chances of an undetected occurrence of the small whorled pogonia are very slim, its cryptic nature and the consequent uncertainty led to its inclusion in an effects discussion in this section of the BE/BA and an informal consult was conducted with the US Fish and Wildlife Service.

The small whorled pogonia is a federally listed Threatened plant, with the largest cluster of sites found in the Appalachian Mountains of New England and coastal Massachusetts, and two moderate-sized clusters centered in the southern Appalachians and the Coastal Plain and

Piedmont of Virginia, Delaware, and New Jersey. The small whorled pogonia is a native orchid, usually found in acidic soils, in dry to mesic second-growth, deciduous or deciduous-coniferous forests. It typically is in an area with light to moderate leaf litter, an open herb layer (occasionally dense ferns), moderate to light shrub layer, and relatively open canopy. *Isotria medeoloides* frequently occurs on flats or slope bases near canopy breaks.

The project area contains a population of the small whorled pogonia discovered in 1994. Since its discovery, the population has been monitored annually. Over time, the number of flowering plants declined; until eventually, no plants emerged at all. After two years of no emergence, a plan to try to stimulate re-emergence, and hopefully flowering, was developed, based on recommendations from researchers and through informal consultation with the USFWS. The project involved selectively cutting down roughly half of the overstory canopy cover to stimulate the plants through increased sunlight reaching the forest floor. Monitoring since project implementation has not revealed emerging or flowering plants at the site.

At the request of the USFWS, additional surveys specifically for the small whorled pogonia were conducted in all areas proposed for ground disturbance. No additional individuals or populations were located.

Prescribed burns implemented in the past have protected the known occurrences of small whorled pogonia by placing temporary fire lines constructed with a leaf blower around them and misting the area periodically with water to prevent ignition from embers drifting into the site from the adjacent burn. These same measures would be implemented for this and future prescribed burns.

No harvest units, road building or skid trails/roads are planned in the vicinity of the known occurrence of small whorled pogonia.

Non-native, invasive weeds treatment will not be allowed in the immediate vicinity of the known occurrence. Treatments in the general area will be hand-application; targeting only nonnative species.

A "may affect, not likely to adversely affect" determination is therefore made for the small whorled pogonia for the proposed actions. Informal consultation with the USFWS is required. An informal consultation process with the USFWS began in early January of 2012. After consideration, the FWS concurred with the "may affect, not likely to adversely affect" for the small whorled pogonia in a letter dated March 14, 2012. A copy of this letter is available in the project file.

Effects to Sensitive Species

Eastern small-footed bat *(Myotis leibii)*

The eastern small-footed bat is a Sensitive species that typically uses caves for hibernation, and roosts and sleeps in cracks and crevices in rock outcrops and clifflines during summer. Since there are no known caves in the project areas, there will be no effect on winter habitat. The harvest may be done during times when bats could be present in the clifflines/outcrops. Even though there is potential spring and summer roosting habitat in some of the project areas, clifflines in the project areas will be avoided in harvest units. Leave-trees will be "clumped," and may be located adjacent to or near significant clifflines/outcrops.

Harvest units would create insect-rich foraging areas and flight corridors. Fire burning over much of the prescribed burn area would be a backing fire that should not significantly alter the overstory around potential summer roosting habitat. Prescribed burning should thin the midstory, allowing for enhanced flight corridors for foraging. Like the other *Myotis* species mentioned above, the eastern small-footed bat is an insectivore, capturing its prey in flight. More open understory conditions should be favorable to this species as it forages.

Non-native, invasive weeds in the project area would be spot-treated with approved herbicides, and this should have a beneficial effect on the eastern small-footed bat. Spot treatment will remove competing vegetation. This will allow native vegetation to recover from the competition, and also allow native insects to better colonize and reproduce in the treated area. This should be a slight benefit to the eastern small-footed bat.

Since likely roosting sites will be avoided during timber harvest and prescribed burning, and herbicide treatment could slightly enhance foraging for this species, the net effect should be beneficial. There will be no direct, indirect, or cumulative effect from the stand improvement, site preparation, or planting and seeding proposed post-harvest. The proposed actions should not impact the species as a whole, or cause a trend toward federal listing.

Diana fritillary (*Speyeria diana*)

The Diana fritillary butterfly is a Sensitive species that requires violet leaves for its overwintering larvae. The butterfly lays its eggs on the leaves of the host plant (the violets); the eggs hatch in the autumn and then metamorphose into the first larval stage. The larvae then pass the winter without eating; when spring returns, they complete their development, feeding primarily at night. The Diana fritillary was not seen during field surveys of this project area, but favorable habitat is present and could be enhanced. Harvest may enhance some of the sites, creating open understory that violet species would favor. Prescribed burning should thin the midstory, allowing more light to reach the forest floor, and should favor the violet hosts of this species. The reopening and daylighting of roads in the project area should create favorable conditions for the growth of common milkweed *Asclepias syriaca*, a favorite food source for adults of this and many other butterflies. The project may decrease the current size of the local Diana fritillary population through:

- vehicle mortality from collisions with adults, and crushing of pupa, larvae, and eggs by skidders
- eggs, pupa, and larvae could be destroyed by prescribed fire, depending on the season of the burn
- short-term reduction in the larval and adult food sources by reduction in violets (for the larvae) directly impacted by the prescribed fire and reduction of the amount of milkweed available in the project area due to road improvements, maintenance, and brushing
- herbicide application could have a short term effect on the Diana fritillary, since the spot treatment of the non-native invasive plants may occasionally impact the violet species favored by the butterfly. Treatment would be confined to the spots of vegetation that occur along roads, so herbicide would not be applied in a continuous or large area. Removal of the non-native invasive plants will allow better growth of the native violets and milkweed, thus providing more food source in the long-term for the larvae and adults.

Wider roads clearances created by the road maintenance and brushing will provide better habitat for milkweed, and a more open canopy created by prescribed fire will benefit the violets. Due to the abundance of violet species found in the general area, the likelihood that prescribed burning and spot herbicide treatments will enhance the habitat for the violets favored by this species, and the likelihood of the re-population of the proposed harvest units by Diana fritillary present in adjacent stands, this project may impact individuals, but the actions should not affect the species as a whole, or cause a trend toward federal listing. There should be no direct, indirect, or cumulative negative effects to Diana fritillary from the proposed activities of this project.

In the long term, the net effect should be an improvement in habitat for both the larvae and adults of this species.

Small spreading pogonia *(Cleistes bifaria)*

The small spreading pogonia is a Sensitive species that may benefit from the effects of the proposed actions. *Cleistes bifaria* is an orchid that requires open habitat with a sparse woody canopy, and harvest would help create such a habitat by temporarily removing competing herbaceous vegetation and shrubs. Prescribed burning will also thin the midstory, allowing more light to reach the forest floor. Non-native, invasive weeds in the project area would be spot-treated with approved herbicides, and this should have a beneficial effect on the small spreading pogonia, since spot treatment will remove competing vegetation. This will allow the native vegetation to recover from the competition.

There are known occurrences of *C. bifaria* in the project area, including some that occur in proposed harvest units. Depending on the placement of landings and skid trails, these individuals could be impacted. Individual plants not identified in surveys could be destroyed by skid road construction and skid trail traffic in harvest stands. Since the small spreading pogonia would in all likelihood benefit from clearing of vegetation both by timber harvest and spot herbicide treatments, and the thinning of the midstory by prescribed fire, there should be no net negative effects from this proposed action. This species is known from all counties of the Clinch Ranger District and known occurrences number in the hundreds. While this project may effect individuals, the proposed actions should not impact the species as a whole or cause a trend toward federal listing. There should be no direct, indirect, or cumulative effects to the small spreading pogonia from the proposed activities of this project.

In the long term, the net effect should be an improvement in habitat for this species.

Effects to sweet pinesap *(Monotropsis odorata)*

Sweet pinesap is a saprophytic, vascular plant inhabiting pine dominated forests and pine-oak heaths. It is a monotypic endemic species centered in the Appalachian Mountains, found more frequently in North Carolina and Virginia and becoming rarer towards the limits of its range. The range is from Maryland and West Virginia south to Alabama, Georgia and possibly Florida. This species is known to occur in at least 20 Virginia counties and has been found in the project area.

Sweet pinesap typically grows in well drained, dry to mesic, acidic soil in oak-heath woodlands, often with white pine and rhododendron. It flowers very early in the year (February to early April) and has been seen flowering when snow is on the ground. It is often overlooked since it grows well hidden under the leaf litter and is usually found by smell since it is quite fragrant.

Some individual sweet pinesap plants may be killed with implementation of the project by being crushed by skidders or falling trees, or during the construction of skid roads or landings. Favoring oak species in the thinning areas should benefit the sweet pinesap in the long term since the sweet pinesap is saprophytic on oak roots.

Herbicide application should have no effect on the sweet pinesap, since a very small portion of the area would actually be spot treated. Treatment would be mostly confined to the spots of vegetation that occur along roads, so herbicide would not be applied in a continuous or large area.

Prescribed burning activities could impact individuals, but should be beneficial to the species as a whole since prescribed burning would favor the oaks, the sweet pinesap host.

While these proposed activities may impact individuals, the actions should not affect the species as a whole, or cause a trend toward federal listing. There should be no direct, indirect, or cumulative effects to the sweet pinesap from the proposed activities of this project.

Effects to Barrens tiger beetle *(Cicindela patruela)*

The Barrens tiger beetle is a Sensitive species which prefers dry, sandy soils with sparse vegetation, such as along woodland roads and at edges of sandstone quarries. The beetle has a two-year life cycle, overwintering the first year as a mature larva and the second year as an adult. The adult will emerge in late summer, and may be encountered for a short time before hibernating. The beetle is usually more abundant during the following spring when it feeds and reproduces; it then later dies during early summer. It may be generally uncommon, but abundant locally if suitable habitat is present.

The road re-construction associated with timber harvest may impact individuals by crushing or destroying larvae or their burrows, although adults can escape the machinery by flying away. Timber harvest itself should have no effect on the Barrens tiger beetle, since they are not typically found in a forested area.

Some beetles may be killed by a growing season burn; however, the Barrens tiger beetle is capable of flying quickly away from threats, or burrowing.

Spot application of herbicide may affect individuals since most of the applications would be along roadsides and in clearings, places where the Barrens tiger beetle would be found. Since these beetles and their larvae are predatory and very mobile (adults), they may consume other insects who may have consumed plants that have been treated with the herbicide. This action may affect individuals of the Barrens tiger beetles.

While these proposed actions may affect individuals, the actions should not affect the species as a whole, or cause a trend toward federal listing. There should be no direct, indirect, or cumulative effects to the Barrens tiger beetle from the proposed activities of this project.

Critical Habitat for Threatened and Endangered Aquatic Species

Critical habitat has been defined by the Fish and Wildlife service as:

> "A specific geographic area(s) that is essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery."

Critical habitat for two fish species, yellowfin madtom and slender chub, has been identified in the mainstem Clinch and Powell Rivers, and in Copper Creek. Critical habitat has also been identified for four mussel species: the rough rabbitsfoot, oyster mussel, Cumberlandian combshell, and purple bean, in the mainstem Clinch and Powell Rivers, Indian Creek, and Copper Creek.

Determination of Effect to Critical Habitat

The Critical Habitat reaches in the mainstem Powell River defined above exist over 25 river miles downstream of the proposed burn unit, timber harvest, and associated projects. The designated critical habitat is well outside the cumulative effects boundary set by the hydrologic analysis, the point beyond which the effects from the proposed action would be immeasurable and indistinguishable from background levels.

Therefore, there will be no measurable direct or indirect cumulative effects on designated critical habitat. There will be no destruction or adverse modification to designated critical habitat.

Determinations of Effect to species

Threatened (T) and Endangered (E)

The following table is a summary of the effects determination to Threatened and Endangered species from the implementation of this project:

Species	Status	Effects Determination
Indiana bat	E	No effect, beyond those already disclosed through previous consultation (see the Indiana bat BO)
small whorled pogonia	T	May effect, not likely to adversely affect
blackside dace	T	No effect, beyond those already disclosed through previous consultation (see the Mussel and Fish Conservation Plan)

Other than the three species listed above, the proposed project will have no negative effect on any federally listed threatened, endangered, or proposed species.

Forest Service Sensitive (S) Species

The following table is a summary of the effects determination to Sensitive species from the implementation of this project:

Species	Effects Determination
eastern small-footed bat	No effect
Diana fritillary	No effect
barrens tiger beetle	No effect
sweet pinesap	No effect
small spreading pogonia	No effect

The project will have no significant impact on any sensitive species.

APPENDIX A
Documentation of Threatened, Endangered or Sensitive Species Occurrences for Wells Branch Vegetation Management Project
Coding for Occurrence Analysis Results (OAR) for 190 species

Forest updated April 1, 2011 (based on Region 8 sensitive species list effective January 1, 2002)

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
VERTEBRATES										
Fish										
7		X	Ammocrypta clara	Western sand darter	Clinch R, Powell R	Aquatic-rivers	S	G3	S1	-
1		X	Cottus baileyi	Black sculpin	Little R, Upper Clinch R, S Fork Holston R	Aquatic-streams	S	G4Q	S2	-
1		X	Erimonax monachus	Spotfin chub	Lower N Fk Holston R	Aquatic-streams	T	G2	S1	-
7		X	Erimystax cahni	Slender chub	Two sites - Powell R, Lee Co	Aquatic-rivers	T	G1	S1	-
1		X	Etheostoma acuticeps	Sharphead darter	S and Middle Fk Holston R	Aquatic-rivers	S	G3	S1	-
1		X	Etheostoma susanae	Cumberland Johnny darter	Endemic to Upper Cumberland R watershed near VA	Aquatic-streams	PE	G2	S1 (KY)	-
1		X	Etheostoma osburni	Candy darter	Big Stony Ck, Laurel Fork in New R watershed	Aquatic-streams	S	G3	S1	S2
1		X	Etheostoma percnurum	Duskytail darter	Copper Ck, Clinch R	Aquatic-rivers	E	G1	S1	-
1		X	Etheostoma tippecanoe	Tippecanoe darter	Four sites Clinch R, lower Copper Ck	Aquatic-rivers	S	G2	S1	S2
7		X	Icthyomyzon greeleyi	Mountain brook lamprey	M, N Fk Holston R, Copper Ck, Indian Ck, Clinch R, Powell R	Aquatic-rivers	S	G3G4	S2	S1
7		X	Notropis ariommus	Popeye shiner	N Fk Holston R, Clinch R, Powell R	Aquatic-rivers	S	G3	S2S3	S2
1	X	X	Notropis semperasper	Roughhead shiner	Upper James R watershed above Buchanan	Aquatic-rivers	S	G2G3	S2S3	-
7		X	Noturus flavipinnis	Yellowfin madtom	Lower & Mid reaches of Copper Ck, Powell R	Aquatic-streams	T	G1	S1	-
1	X	X	Noturus gilberti	Orangefin madtom	S Fk Roanoke R watershed, Roanoke R above Salem, Craig Ck, Johns Ck, Cowpasture R	Aquatic-streams	S	G2	S2	-
1		X	Percina burtoni	Blotchside logperch	N Fk Holston R, Clinch R, Copper Ck, Little R	Aquatic-rivers	S	G2G3	S1	-
1		X	Percina macrocephala	Longhead darter	N Fk Holston R above Saltville, lower Copper Ck	Aquatic-rivers	S	G3	S1S2	S2
1		X	Percina rex	Roanoke logperch	Upper Roanoke R watershed	Aquatic-rivers	E	G1G2	S1S2	-
1		X	Phenacobius crassilabrum	Fatlips minnow	Unimpounded lower S Fk Holston R, Whitetop Laurel Ck	Aquatic-rivers	S	G3G4	S2	-
1		X	Phenacobius teretulus	Kanawha minnow	Upper New R watershed	Aquatic-streams	S	G3G4	S2S3	S1
9		X	Phoxinus cumberlandensis	Blackside dace	Upper Cumberland R, Upper Powell R, Poor Fk Cumberland R	Aquatic-streams	T	G2	S1	S3 (KY)
1		X	Phoxinus tennesseensis	Tennessee dace	Lick Ck, N Fk Holston R, Beaverdam Ck, M Fk Holston R	Aquatic-streams	S	G3	S1	-
Amphibian										
1		X	Plethodon hubrichti	Peaks of Otter salamander	Peaks of Otter, Apple Orchard Mtn	Mixed oak, late successional with loose rocks and logs, >1800'	S	G2	S2	-
1	X		Plethodon punctatus	Cow Knob salamander	Shenandoah Mtn, VA & WV	Mixed oak, late successional with loose rocks and logs, >2500'	S	G3	S2	S1
1			Plethodon shenandoah	Shenandoah salamander	Three isolated populations in SNP: Hawksbill Mtn, The Pinnacles, Stony Man Mtn. GW occurrence questionable.	Talus slopes. Erroneous records from Three Ridges, The Priest, Pompeii on the Pedlar.	E	G1	S1	-
1		X	Plethodon welleri	Weller's salamander	Mt Rogers & Whitetop Mtn	Spruce-fir forests and adjacent northern hardwoods	S	G3	S2	-
Birds										
1	X	X	Falco peregrinus	Peregrine Falcon	Hack sites late 80s & early 90s – Mt Rogers, Grayson; Cole Mtn, Amherst; Big Schloss, Shenandoah; Elliot Knob, Augusta; High Knob, Rockingham Cos. No nests, current migrant.	Nests on ledges or cliffs, buildings, bridges, quarry walls. Non-breeding sites, farmland, open country, lakeshores, broad river valleys, airports, cities. Prefers pigeons, ducks.	S	G4	S1B/S2N	S1B/S2N
1	X		Haliaeetus leucocephalus	Bald Eagle	Potomac R, James R, New R, Upper Tennessee watersheds	Feeds and nests on or near large lakes and rivers	S	G5	S2S3B/S3N	S2B/S3N

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
1	X		Lanius ludovicianus migrans	Migrant Loggerhead Shrike	Ridge & Valley (Shenandoah Valley)	Open grasslands with trees and shrubs, fencerows	S	G4	S2B/S3N	S1B/S2N
1	X	X	Thryomanes bewickii altus	Appalachian Bewick's Wren	Historical records in Botetourt, Giles, Highland Washington Cos	Thickets, old fields, fencerows, old home sites	S	G5T2Q	SHB/S1N	S1B/S1N
Mammals										
2	X	X	Corynorhinus townsendii virginianus	Virginia big-eared bat	Summer: VA - Tazewell Co. (3 caves), Highland Co. (1 cave), WV - Pendleton Co. (4 caves); Winter: Highland, Rockingham, Bland, & Tazewell Cos. (6 caves), Pendleton Co. (6 caves), largest VA population in Tazewell Co. & largest WV population in Pendleton Co. Small #'s of bats (usually <10) in a few other widely scattered caves during summer months. Bath & Pulaski County records are historic. No occupied caves currently known on Forest.	Resides in caves winter and summer. Short distance migrant (<40 miles) between winter and summer caves. Forages primarily on moths and foraging habitat is common (fields, forests, meadows, etc.). Forages within 6 miles of summer caves. USFWS Critical Habitat is 5 caves in WV (4 Pendleton Co. & 1 Tucker Co.). Closest Critical Habitat cave to GWJNF is ~3 miles in Pendleton Co., WV. OAR code of "2" used when project further than 6 miles from summer or winter occupied cave.	E	G4T2	S1	S2
1		X	Glaucomys sabrinus coloratus	Carolina northern flying squirrel	Mt Rogers & Whitetop area	Spruce-fir forests and adjacent northern hardwoods	E	G5T1	S1	-
1	X		Glaucomys sabrinus fuscus	Virginia northern flying squirrel	Laurel Fork area, Highland Co	Spruce forests and adjacent northern hardwoods	E	G5T2	S1	S2
1	X		Microtus chrotorrhinus carolinensis	Southern rock vole	Alleghany Mtn, Bath Co	Cool, moist, mossy talus under oaks/northern hardwoods	S	G4T3	S1	S2
1		X	Myotis grisescens	Gray bat	Ridge & Valley, Clinch R watershed	Caves winter and summer, forages widely	E	G3	S1	-
6	X	X	Myotis leibii	Eastern small-footed bat	Ridge & Valley	Hibernates in caves during winter, roosts in crevices of large rock outcrops, cliffs, & under large rocks in talus & boulder-fields during summer, plus similar man-made structures like rip-rap and bridges, forages widely in all forested and open habitat types over both ridges and valleys.	S	G3	S2	S1
6	X	X	Myotis sodalis	Indiana bat	Blue Ridge, Ridge & Valley, Cumberland Mtns	Caves winter, upland hardwoods summer, forages widely along riparian areas and open woodlands	E	G2	S1	S1
1	X		Sorex palustris punctulatus	Southern water shrew	Alleghany Mtn, Bath Co; & Laurel Fork, Highland Co	Riparian areas w/in spruce-fir forests and northern hardwoods	S	G5T3	S1S2	S1
INVERTEBRATES										
Snail (Mollusk, Class Gastropoda)										
1	X	X	Glyphyalinia raderi	Maryland glyph	Alleghany, Montgomery Cos	Calciphile, edge of seeps within leaf litter	S	G2	S1S2	S2
1	X		Helicodiscus diadema	Shaggy coil	Alleghany Co	Calciphile, limestone rubble and talus	S	G1	S1	-
1	X		Helicodiscus lirellus	Rubble coil	Rockbridge Co	Calciphile, limestone rubble and talus	S	G1	S1	-
1	X	X	Helicodiscus triodus	Talus coil	Alleghany, Botetourt, Rockbridge Cos	Calciphile, limestone rubble on wooded hillsides and near cave entrances	S	G2	S1S2	SH
1		X	Io fluvialis	Spiny riversnail	Clinch R, N Fk Holston R	Aquatic-rivers	S	G2	S2	-
1		X	Paravitrea reesi	Round supercoil	Monroe, Summers Cos, WV	Calcareous woodlands and glades	S	G3	S2	S1
Clam and Mussel (Mollusk, Class Bivalvia)										
1	X		Alasmidonta varicosa	Brook floater	Potomac drainage	Aquatic-rivers	S	G3	S1	S1
1		X	Cumberlandia monodonta	Spectacle case	2 sites Clinch R	Aquatic-rivers	PE	G3	S1	-
1		X	Cyprogenia stegaria	Fanshell	Lower Clinch R, Scott Co	Aquatic-rivers	E	G1Q	S1	S1
7		X	Dromus dromas	Dromedary pearlymussel	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers	E	G1	S1	-
1	X	X	Elliptio lanceolata	Yellow lance	Roanoke R, James R	Aquatic-rivers	S	G2G3	S2S3	-
7		X	Epioblasma brevidens	Cumberlandian combshell	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers	E	G1	S1	-
7		X	Epioblasma capsaeformis	Oyster mussel	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers	E	G1	S1	-
1		X	Epioblasma florentina walkeri	Tan riffleshell	Clinch R, M Fk Holston R, N Fk Holston R	Aquatic-rivers	E	G1T1Q	S1	-
1		X	Epioblasma torulosa gubernaculum	Green-blossom pearlymussel	Clinch R, N Fk Holston R	Aquatic-rivers	E	G2TX	SX	-
7		X	Epioblasma triquetra	Snuffbox	Clinch R, Powell R, N Fk Holston R	Aquatic-rivers	PE	G3	S1	S2
7		X	Fusconaia barnesiana	Tennessee pigtoe	Clinch R, Powell R, N Middle, S Fk Holston R	Aquatic-rivers	S	G2G3	S2	-
7		X	Fusconaia cor	Shiny pigtoe	Clinch R, Powell R, N Fk Holston R, Copper Ck	Aquatic-rivers	E	G1	S1	-
7		X	Fusconaia cuneolus	Fine-rayed pigtoe	Clinch R, Powell R, Copper Ck, Little R	Aquatic-rivers	E	G1	S1	-
1		X	Fusconaia masoni	Atlantic pigtoe	Roanoke R, Craig Ck drainage	Aquatic-rivers	S	G2	S2	-
7		X	Hemistena lata	Cracking pearlymussel	Clinch R, Powell R	Aquatic-rivers	E	G1	S1	-
1		X	Lampsilis abrupta	Pink mucket	Clinch R	Aquatic-rivers	E	G2	SX	S1
1		X	Lasmigona holstonia	Tennessee heelsplitter	Upper Clinch, N and M Fk Holston R drainages; Wolf Ck, Bland Co below Burkes Garden	Aquatic-streams	S	G3	S1	-
1	X		Lasmigona subviridis	Green floater	Widely distributed in N & S Fk Shenandoah R, Pedlar R, James R	Aquatic-rivers	S	G3	S2	S2
7		X	Lemiox rimosus	Birdwing pearlymussel	Clinch R, Powell R, Copper Ck, Little R	Aquatic-rivers	E	G1	S1	-
1		X	Lexingtonia dolabelloides	Slabside pearlymussel	Clinch R, M Fk Holston, N Fk Holston R	Aquatic-rivers	S	G2	S2	-
1		X	Pegias fabula	Little-winged pearlymussel	Clinch R, N Fk Holston R, S Fk Holston R, Little R	Aquatic-streams	E	G1	S1	-
7		X	Plethobasus cyphyus	Sheepnose	Clinch R, Powell R	Aquatic-rivers	PE	G3	S1	S1
1	X	X	Pleurobema collina	James spinymussel	Potts Ck, Craig Ck, Johns Ck, Patterson Run, Pedlar R, Cowpasture R, Mill Ck (Deerfield)	Aquatic-rivers	E	G1	S1	S1
1		X	Pleurobema cordatum	Ohio pigtoe	Clinch R	Aquatic-rivers	S	G4	S1	S2
1		X	Pleurobema oviforme	Tennessee clubshell	Clinch R, Powell R, N, Middle, S Fk Holston R	Aquatic-streams	S	G2G3	S2S3	-
1		X	Pleurobema plenum	Rough pigtoe	Clinch R	Aquatic-rivers	E	G1	SH	-
1		X	Pleurobema rubrum	Pyramid pigtoe	Upper Clinch R	Aquatic-rivers	S	G2G3	SH	-
7		X	Quadrula cylindrica strigillata	Rough rabbits foot	Clinch R, Powell R, N Fk Holston R, Copper Ck	Aquatic-streams	E	G3G4T2	S2	-

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
7		X	Quadrula intermedia	Cumberland monkeyface	Powell R	Aquatic-rivers	E	G1	S1	-
7		X	Quadrula sparsa	Appalachian monkeyface	Clinch R, Powell R	Aquatic-rivers	E	G1	S1	-
1		X	Toxolasma lividus	Purple lilliput	N Fk Holston R, Clinch R	Aquatic-rivers	S	G2	SH	-
1		X	Villosa perpurpurea	Purple bean	Clinch R, Copper Ck	Aquatic-rivers	E	G1	S1	-
1		X	Villosa trabalis	Cumberland bean	Clinch R	Aquatic-rivers	E	G1	SX	-
Spider (Arachnid)										
1		X	Microhexura montivaga	Spruce-fir moss spider	Mt Rogers	Damp, well-drained moss and liverwort mats on boulders in mature spruce-fir forests	E	G1	S1	-
Pseudoscorpion (Arachnid, Order Pseudoscoriones)										
1		X	Kleptochthonius orpheus	Orpheus cave pseudoscorpion	Patton cave, Monroe Co, WV	Caves	S	G1	-	S1
Amphipod (Crustacean, Order Amphipoda)										
1		X	Stygobromus abditus	James cave amphipod	James & Sam Bells caves, Pulaski Co; Watsons cave, Wythe Co; & other New River caves	Caves	S	G2G3	S2	-
2		X	Stygobromus cumberlandus	Cumberland cave amphipod	Lee, Scott, Wise Cos	Caves	S	G3G4	S1S2	-
1		X	Stygobromus estesi	Craig County cave amphipod	Caves in Upper Sinking Ck Valley and Potts Ck, Poverty Hollow seeps, Captain seeps	Caves, seeps	S	G4	S3	-
1		X	Stygobromus fergusoni	Montgomery County cave amphipod	Botetourt, Montgomery Cos	Caves	S	G2G3	S1	-
1	X		Stygobromus gracilipes	Shenandoah Valley cave amphipod	Frederick, Rockingham, Shenandoah, Warren Cos	Caves	S	G3G4	S2S3	S1
1	X		Stygobromus hoffmani	Alleghany County cave amphipod	Lowmoore cave, Alleghany Co	Caves	S	G1	S1	-
1	X		Stygobromus mundus	Bath County cave amphipod	Alleghany, Bath Cos	Caves	S	G2G3	S1S2	-
Isopod (Crustacean, Order Isopoda)										
1		X	Caecidotea incurva	Incurved cave isopod	Smyth, Wythe Cos	Caves	S	G2G4	S2	-
1	X	X	Miktoniscus racovitzai	Racovitza's terrestrial cave isopod	Alleghany, Botetourt, Page, Rockbridge, Shenandoah Cos	Caves	S	G3G4	S2	-
Millipede (Class Diplopoda)										
1		X	Brachoria dentata	A millipede	Known only from Pennington Gap and Cave Spring Recreation Area, Lee Co	Leaf litter, deciduous forests	S	G1	S1	-
1		X	Brachoria eutypa ethotela	Hungry Mother millipede	Pine Mtn above Troutdale	Leaf litter, deciduous forests	S	G2	S2	-
1		X	Buotus carolinus	A millipede	Brush Mtn, Whitetop Mtn, Apple Orchard Mtn, Tazewell Beartown	Beech leaf litter, deciduous forests	S	G3	S3	-
1		X	Cleidogona hoffmani	Hoffman's cleidogonid millipede	Mt Rogers, Whitetop Mtn, Elk Garden; Hamilton cave (private) Bland Co	Mountaintop species, leaf litter, deciduous forests	S	G3	S2S3	-
1		X	Cleidogona lachesis	A millipede	Whitetop Mtn & Mt Rogers	Beech leaf litter, deciduous forests	S	G2	S1	-
1		X	Dixioria fowleri	Fowler's millipede	Walker Mtn; Comers Rock on Iron Mtn; Laurel Ck, Damascas; 1/2 mile west of NRA office; Tazewell Beartown	Leaf litter, deciduous forests	S	G2	S2	-
1		X	Dixioria pela coronata	A millipede	Endemic to Mt Rogers	Leaf litter, northern hardwood and spruce-fir forests. Altitudinally restricted, >5000'.	S	G2T2	S2	-
1	X		Nannaria shenandoah	Shenandoah Mountain xystodesmid millipede	One site: along Long Run Road, Rockingham Co	Leaf litter, mixed oak forest	S	G1	S1	-
1	X		Pseudotremia alecto	A millipede	Griffith Knob, Alleghany Co; near Mountain Grove saltpetre cave, Bath Co	Leaf litter, deciduous forests	S	G1	S1	-
1	X	X	Semionellus placidus	A millipede	Hawksbill Mtn, Apple Orchard Mtn, Tomahawk Mtn	Leaf litter, deciduous forests	S	G3	S2	-
Centipede (Insect, Order Chilopoda)										
1	X	X	Escaryus cryptorobius	Montane centipede	The Priest, Nelson Co; Whitetop Mtn, Washington Co	Upper soil horizon, spruce - birch forests	S	G2	S2	-
1		X	Escaryus orestes	Whitetop Mountain centipede	Whitetop Mtn, Washington Co	Dark moist soil and litter, spruce - birch forests	S	G1G2	S1S2	-
1	X		Nampabius turbator	A cave centipede	One known site: Lowmoore cave, Alleghany Co	Caves	S	G1G2	S1	-
Springtail (Insect, Order Collembola)										
2	X	X	Pygmarrhopalites carolynae	A cave springtail	Augusta, Highland, Bath, Lee, Wise Cos	Caves	S	G2G3	S1	-
2		X	Pygmarrhopalites commorus	A cave springtail	Giles, Lee, Wise Cos	Caves	S	G2G4	S1	-
1	X		Pygmarrhopalites sacer	A cave springtail	Bath Co	Caves	S	G1G2	S1	-
Mayfly (Insect, Order Ephemeroptera)										
1		X	Leptophlebia johnsoni	Johnson's pronggill mayfly	One location: Lewis Fk north slope Mt Rogers	Aquatic-streams	S	G4	S1	-
Dragonfly and Damselfly (Insect, Order Odonata)										
1	X	X	Gomphus viridifrons	Green-faced clubtail	New R, Craig Ck, Pound R, Locust Spring	Aquatic-rivers	S	G3G4	S2	S2
1		X	Ophiogomphus incurvatus alleghaniensis	Allegheny snaketail	Rich Ck, Giles Co	Aquatic-streams	S	G2G3T2T3	S1	S1
Stonefly (Insect, Order Plecoptera)										
1		X	Acroneuria kosztarabi	Virginia stonefly	Station Spring Ck, Tazewell Co	Aquatic-streams	S	G1	S1	-
1		X	Isoperla major	Big stripetail stonefly	Burkes Garden, Tazewell Co	Aquatic-streams	S	G1	S1	-
1		X	Megaleuctra williamsae	Smokies needlefly	Mt Rogers & Whitetop Mtn	Aquatic-streams	S	G2	S1S2	-
1		X	Taeniopteryx nelsoni	Cryptic willowfly	Lewis Fk & Grindstone Branch N of Mt Rogers	Aquatic-streams	S	G1	S1	-
Beetle (Insect, Order Cloeoptera)										
1	X	X	Cicindela ancocisconensis	Appalachian tiger beetle	Alleghany, Bath, Highland, Lee, Rockbridge, Washington, Wise Cos	Riparian – sandy/silty edges of streams and rivers	S	G3	S2	S3
6	X	X	Cicindela patruela	Northern barrens tiger beetle	Blue Ridge, Ridge & Valley	Eroded slopes of exposed sandstone and conglomerate	S	G3	S2	S2S3

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
1		X	Cyclotrachelus incisus	A ground beetle	Breaks Interstate Park, Dickenson Co	Dry, well drained site, red maple, magnolia, mountain laurel	S	G4	S1	-
1	X	X	Hydraena maureenae	Maureen's hydraenan minute moss beetle	Alleghany, Bath, Botetourt, Bland, Craig, Cos	Interstitial water in riparian-shale substrate along stream edge	S	G2?	S2?	-
Scorpionfly (Insect, Order Mecoptera)										
1		X	Brachypanorpa jeffersoni	Jefferson's short-nosed scorpionfly	Sugar Run Mountain, Giles Co; Whitetop Mtn, Smyth Co	Moist soil around seeps. Only known from high elevation. Larvae use short burrows in loose soil and moss.	S	G2	S1S2	-
Butterfly and Moth (Insect, Order Lepidoptera)										
1	X	X	Callophrys irus	Frosted elfin	Frederick, Montgomery, Page, Roanoke Cos	Dry, open woods, clearings, and road/powerline ROWs w/ abundant wild indigo (*Baptisia tinctoria*)	S	G3	S2?	S1
2	X	X	Erynnis persius persius	Persius duskywing	Blue Ridge, Ridge & Valley	Bogs, wet meadows, open seepages in boreal forests	S	G5T1T3	S1	-
2	X		Pyrgus centaureae wyandot	Appalachian grizzled skipper	Ridge & Valley	Shale barrens, open shaley oak woodlands	S	G5T1T2	S1	S1
6	X	X	Speyeria diana	Diana fritillary	Blue Ridge, Ridge & Valley	Grasslands-shrublands, near streams with thistles and milkweeds, larval host plant, violets	S	G3G4	S3	S2S3
1	X	X	Speyeria idalia	Regal fritillary	Blue Ridge, Ridge & Valley	Riparian, grasslands-shrublands	S	G3	S1	S1
1	X	X	Catocala herodias gerhardi	Herodias underwing	Bald Knob, Bath; Poverty Hollow, Montgomery Co; Sand Mtn, Wythe Co (non FS property)	Pitch pine/bear oak scrub woodlands, >3000'	S	G3T3	S2S3	SU
1	X		Euchlaena milnei	Milne's euchlaena moth	Warm Springs Mtn, Catawba Creek Slopes, Sweet Spring Hollow, Salt Pond Mtn. (Doe Creek)	Moist, forested slopes of mixed pine hardwoods. Acidic oak woods.	S	G2G4	S2	S2
1	X		Psectrotarsia hebardi	Hebard's noctuid moth	Bath Co	Rich, mesic hardwood forest. Larvae host plant is Canada horse-balm (*Collinsonia canadensis*).	S	GU	SH	-
NON-VASCULAR PLANTS										
Lichen										
1		X	Gymnoderma lineare	Rock gnome lichen	Whitop Mtn.	Spruce-fir forests	S	G2	S1	-
1	X	X	Hydrothyria venosa	Hydrothyria lichen	Augusta, Amherst, Alleghany, Bedford, Botetourt, Giles, Highland, Madison, Nelson, Rockbridge, Shenandoah, Smyth, Wythe Cos	Aquatic – in streams/springs/cascades	S	G4	S1	-
1		X	Hypotrachyna virginica	Virginia hypotrachyna lichen	Mt Rogers & Whitetop Mtn	Spruce-fir forests	S	G1G2	S1	-
Liverwort										
1		X	Bazzania nudicaulis	A liverwort	Mt Rogers & Whitetop Mtn	Bark and rock outcrops in spruce-fir forests	S	G2G3	S?	-
1		X	Frullania oakesiana	A liverwort	Mt Rogers & Whitetop Mtn	Bark in spruce-fir forests	S	G3?	S?	-
1		X	Mertzgeria fruticulosa	A liverwort	Whitetop Mtn	Bark in spruce-fir forests, >5000'	S	G2Q	S?	-
1		X	Nardia lescurii	A liverwort	Blue Ridge, Ridge & Valley	Riparian – on peaty soil over rocks, usually in shade and associated w/ water, <3000'	S	G3?	SU	-
1		X	Plagiochila austinii	A liverwort	Little Stony Ck – Cascades; Red Ck on Beartown Mtn	Rich, moist, densely forested ravines; shaded outcrops	S	G3	S?	-
1		X	Plagiochila sullivantii var sullivantii	A liverwort	Whitetop Mtn, Salt Pond Mtn	Moist shaded rock outcrops, under cliff ledges, in crevices	S	G2T2	S?	-
1		X	Sphenolobopsis pearsonii	A liverwort	Mt Rogers & Whitetop Mtn	Bark of Fraser fir, mountain ash, occasionally red spruce, >5000'	S	G2	S?	-
Moss										
1		X	Sphagnum flavicomans	Northeastern peatmoss	Whitetop Mtn	Bogs, seeps	S	G3	SU	-
VASCULAR PLANTS										
3	X	X	Aconitum reclinatum	Trailing white monkshood	Blue Ridge, Ridge & Valley	Rich cove sites, streambanks, seepages all with high pH	S	G3	S3	S3
1	X	X	Allium oxyphilum	Nodding onion	Monroe, Summers, Mercer, Greenbrier Cos, WV	Shale barrens, sandstone glades	S	G2Q	-	S2
2	X	X	Arabis patens	Spreading rockcress	Frederick, Lee, Page, Shenandoah, Warren Cos	Shaded, calcareous cliffs, bluffs, and talus slopes	S	G3	S2	S2
1	X		Arabis serotina	Shale barren rockcress	Ridge & Valley N of New R watershed	Shale barrens and adjacent open oak woods	E	G2	S2	S2
3	X	X	Berberis canadensis	American barberry	Blue Ridge, Ridge & Valley	Calcareous open woods, bluffs, cliffs, and along fencerows	S	G3	S3S4	S1
1		X	Betula uber	Virginia round-leaf birch	One location: Cressy Ck, Smyth Co	Riparian, mixed open forest, usually disturbed sites	T	G1Q	S1	-
1		X	Botrychium jennmanii	Dixie grapefern	Scott, Wise Cos	Open woods, old fields, pastures	S	G3G4	S1	-
3	X	X	Buckleya distichophylla	Piratebush	Blue Ridge S of Roanoke R, Ridge & Valley S of James R	Open oak and hemlock woods	S	G2	S2	-
3	X	X	Cardamine clematitis	Mountain bittercress	Blue Ridge, Ridge & Valley, S of New R watershed	Riparian, spring seeps, rocky streamsides	S	G3	S1	-
3	X	X	Cardamine flagellifera	Bittercress	Blue Ridge, Ridge & Valley, S of New R watershed	Riparian, spring seeps, rocky streamsides	S	G3	SH	S2
1	X	X	Carex polymorpha	Variable sedge	Blue Ridge, Ridge & Valley, N of James R	Open acid soil, oak-heath woodlands, responds to fire	S	G3	S2	S1
1	X	X	Carex schweinitzii	Schweinitz's sedge	Bath, Montgomery, Pulaski, Washington Cos	Bogs, limestone fens, marl marshes	S	G3G4	S1	-
1		X	Chelone cuthbertii	Cuthbert turtlehead	Blue Ridge Plateau, Grayson, Carroll Cos	Bogs, wet meadows, boggy woods and thickets	S	G3	S2	-
3		X	Cimicifuga rubifolia	Appalachian bugbane	Lower Clinch R watershed	Moist, rich wooded bluffs over limestone	S	G3	S2	-
5		X	Cleistes bifaria	Small spreading pogonia	Craig, Dickenson, Scott, Wise Cos	Well drained, rather open, scrubby hillsides, oak-pine-heath woodlands, acidic soils	S	G4?	S2	S1

OAR	GW	J	Species Name	Common Name	Range on or near GWJNFs	Habitat - Detail	TES	GRank	VA SRank	WV SRank
1		X	Clematis addisonii	Addison's leatherflower	Montgomery, Roanoke, Botetourt, Rockbridge Cos	Open glades & rich woods over limestone & dolostone	S	G2	S2	-
2	X	X	Clematis coactilis	Virginia white-haired leatherflower	Ridge & Valley, Rockbridge Co, S to Wythe Co	Shale barrens, rocky calcareous woodlands	S	G3	S3	-
1	X	X	Corallorhiza bentleyi	Bentley's coralroot	Alleghany, Bath, Giles Cos VA; Monroe, Pocahontas Cos WV	Dry, acid woods, along roadsides, well-shaded trails	S	G1G2	S1	S1
3	X	X	Delphinium exaltatum	Tall larkspur	Blue Ridge, Ridge & Valley	Dry calcareous soil in open grassy glades or thin woodlands	S	G3	S3	S2
1	X		Echinodorus tenellus	Dwarf burhead	Pines Chapel Pond, Augusta Co	Pond margins, wet depressions in sandy soil	S	G5?	S1	-
1	X	X	Echinacea laevigata	Smooth coneflower	Alleghany, Montgomery Cos	Open woodlands and glades over limestone or dolomite	E	G2G3	S2	-
3	X	X	Euphorbia purpurea	Glade spurge	Blue Ridge, Ridge & Valley	Rich, swampy woods, seeps and thickets	S	G3	S2	S2
1		X	Gentiana austromontana	Appalachian gentian	Mt Rogers, Whitetop Mtn, High Knob	High elevation forests and grassy balds. Southern Appalachian endemic	S	G3	S3	S1
1		X	Hasteola suaveolens	Sweet-scented Indian-plantain	Giles, Montgomery, Pulaski Cos	Riverbanks, wet meadows	S	G4	S2	S3
1	X		Heuchera alba	White alumroot	Shenandoah Mtn	High elevation rocky woods and bluffs	S	G2Q	S2?	S2
1	X	X	Hypericum mitchellianum	Blue Ridge St. John's-wort	Blue Ridge, Ridge & Valley	Grassy balds, forest seepages, moderate to high elevations	S	G3	S3	S1
1	X		Helenium virginicum	Virginia sneezeweed	Endemic to Augusta, Rockingham Cos	Seasonally dry meadows and sinkhole depressions	T	G3	S2	-
1	X		Helonias bullata	Swamp-pink	Augusta, Nelson Cos	Sphagnum bogs, seeps, and streamsides	T	G3	S2S3	-
1	X	X	Ilex collina	Long-stalked holly	Blue Ridge, Ridge & Valley	Bogs, seep, shrubby streamheads, >3100'	S	G3	S2	S2
1		X	Iliamna corei	Peter's Mountain-mallow	One location: Narrows, Peters Mountain, Giles Co	Rich, open woods along sandstone outcrops, soil pockets, fire maintained	E	G1Q	S1	-
1	X	X	Iliamna remota	Kankakee globe-mallow	Alleghany, Botetourt, Rockbridge, Bedford Cos	Open, disturbed riverbanks and roadsides	S	G1Q	S1	-
1			Isoetes virginica	Virginia quillwort	Augusta Co	Depression in granitic outcrops in the Piedmont. Does not occur on the Forest.	S	G1	S1?	-
4	X	X	Isotria medeoloides	Small whorled pogonia	In mountains of VA known only from Bedford, Craig, and Lee Cos; other VA occurrences in Piedmont & Coastal Plain	Open, mixed hardwood forests on level to gently sloping terrain with north to east aspect	T	G2	S2	S1
3	X	X	Juglans cinerea	Butternut	Blue Ridge, Ridge & Valley	Well-drained bottomland and floodplain, rich mesophytic forests mostly along toeslopes	S	G4	S3?	S3
3	X	X	Liatris helleri	Turgid Gayfeather	Blue Ridge, Ridge & Valley	Shale barrens, mountain hillside openings	S	G3	S3	S2
3		X	Lilium grayi	Gray's lily	Blue Ridge, Mt Rogers & Whitetop Mtn (occurrences north of Floyd Co questionable)	Bogs, open seeps, wet meadows, grassy balds	S	G3	S2	-
1	X		Lycopodiella margueritae	Marguerite's clubmoss	Bath Co	Seasonally moist soils, wet acidic ditches, borrow pits	S	G2	NA	-
5	X	X	Monotropsis odorata	Sweet pinesap	Blue Ridge, Ridge & Valley	Dry oak-pine-heath woodlands, soil usually sandy	S	G3	S3	S1
2		X	Packera millefolium	Piedmont ragwort	Lee, Scott Cos	Open limestone outcrops and cedar barrens	S	G2	S2	-
2	X		Paxistima canbyi	Canby's mountain lover	Ridge & Valley	Calcareous cliffs and bluffs, usually undercut by stream	S	G2	S2	S2
3	X	X	Phlox buckleyi	Sword-leaf phlox	Blue Ridge, Ridge & Valley	Open, often dry oak woodlands and rocky slopes, usually over shale in humus rich soils, often along roadsides	S	G2	S2	S2
2	X	X	Poa paludigena	Bog bluegrass	Blue Ridge, Ridge & Valley	Shrub swamps and seeps, usually under shade	S	G3	S2	S1
1	X		Potamogeton hillii	Hill's pondweed	Bath Co	Clear, cold calcareous ponds	S	G3	S1	-
3	X		Potamogeton tennesseensis	Tennessee pondweed	Ridge & Valley	Ponds, back water of streams and rivers	S	G2	S1	S2
1		X	Prenanthes roanensis	Roan Mountain rattlesnake-root	Mt Rogers & Whitetop Mtn	Grassy balds, open high elevation forests and outcrops	S	G3	S3	-
1	X	X	Pycnanthemum torrei	Torrey's mountain-mint	Bland, Bath, Giles Rockbridge, Wythe Cos	Open, dry rocky woods, roadsides, and thickets near streams, heavy clay soil over calcareous rock	S	G2	S2?	S1
1		X	Rudbeckia triloba var. pinnatiloba	Pinnate-lobed coneflower	Wise Co	Dry calcareous soil of open woods and roadsides	S	G5T3	S1	-
3		X	Saxifraga caroliniana	Carolina saxifrage	Blue Ridge, Ridge & Valley, S of New R	Moist, shaded rocks and cliffs	S	G3	S3	S1
1	X	X	Scirpus ancistrochaetus	Northeastern bulrush	Ridge & Valley	Mountain ponds, sinkhole ponds in Shenandoah Valley.	E	G3	S2	S1
3	X	X	Scutellaria saxatilis	Rock skullcap	Blue Ridge, Ridge & Valley	Rich, dry to mesic ridgetop woods, 32 counties in VA, likely G4/S4	S	G3	S3	S2
2	X	X	Sida hermaphrodita	Virginia mallow	Ridge & Valley, James R watersheds	Riverbank glades with loose rock or sandy soil	S	G3	S1	S3
3		X	Silene ovata	Mountain catchfly	Lee, Wise Cos	Rich woodlands and forests over limestone	S	G3	S1	-
3		X	Spiraea virginiana	Virginia spiraea	Blue Ridge, Ridge & Valley, S of New R	Scoured banks of streams, riverside or island shrub thickets	T	G2	S1	S1
1	X		Trillium pusillum var. moniticulum	Mountain least trillium	Great North Mtn & Shenandoah Mtn, VA & WV	Open oak woodlands in well drained soil and margins of thickets	S	G3T2	S2	S1
1		X	Tsuga caroliniana	Carolina hemlock	Blue Ridge north to James R.	Rocky ridges and slopes, usually dry and well drained	S	G3	S3	-
2	X	X	Vitis rupestris	Sand grape	Ridge & Valley	Scoured banks of rivers and streams over calcareous bedrock	S	G3	S1?	S2

LEGEND FOR TES SPECIES LIST IN OCCURRENCE ANALYSIS RESULTS:

OAR CODES:

1 = Project located out of known species range.
2 = Lack of suitable habitat for species in project area.

3 = Habitat present, species was searched for during field survey, but not found.
4 = Species occurs in project area, but outside of activity area.
5 = Field survey located species in activity area.
6 = Species not seen during field survey, but possibly occurs in activity area based on habitat observed. or Field survey not conducted when species is recognizable (time of year or time of day). Therefore assume presence and no additional surveys needed.
7 = Aquatic species or habitat known or suspected downstream of project/activity area, but outside identified geographic bounds of water resource cumulative effects analysis area (defined as point below which sediment amounts are immeasurable and insignificant).
8 = Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.
9 = Project occurs in a 6th level watershed included in the USFWS/FS T&E Mussel and Fish Conservation Plan (August 8, 2007 U.S. Fish & Wildlife Service concurrence on updated watersheds). Conservation measures from the USFWS/FS T&E Mussel and Fish Conservation Plan applied.

SPECIES: The term "species" includes any subspecies of fish, wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife, which interbreeds when mature. (Endangered Species Act of 1973, as amended through the 100th Congress)

RANGE: The geographical distribution of a species. For use here "range" is expressed as where a species is known or expected to occur on or near the George Washington and Jefferson National Forests in terms of landform (feature name, physiographic province), political boundary (county name), or watershed (river, or stream name).

HABITAT: A place where the physical and biological elements of ecosystems provide a suitable environment and the food, cover and space resources needed for plant and animal livelihood. FSM 2605-91-8, pg 10 of 13

TES CODES:

T = Federally listed as Threatened
E = Federally listed as Endangered
P = Federally Proposed as T or E
S = Southern Region (R8) Sensitive species

GLOBAL RANK: Global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, NatureServe and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species or variety. This system was developed by The Nature Conservancy and is widely used by other agencies and organizations as the best available scientific and objective assessment of taxon rarity and level of threat to its existence. The ranks are assigned after considering a suite of factors including number of occurrences, numbers of individuals, and severity of threats.

G1 = Extremely rare and critical imperiled with 5 or fewer occurrences or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.
G2 = Very rare and imperiled with 6 to 20 occurrences or few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.
G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range; or vulnerable to extinction because of other factors. Usually fewer than 100 occurrences are documented.
G4 = Common and apparently secure globally, though it may be rare in parts of its range, especially at the periphery.
G5 = Very common and demonstrably secure globally, though it may be rare in parts of its range, especially at the periphery.
GH = Formally part of the world's biota with the exception that may be rediscovered.
GX = Believed extinct throughout its range with virtually no likelihood of rediscovery.
GU = Possibly rare, but status uncertain and more data needed.
G? = Unranked, or, if following a ranking, ranking uncertain (ex. G3?).
G_Q = Taxon has a questionable taxonomic assignment, such as G3Q.
G_T = Signifies the rank of a subspecies or variety. For example, a G5T1 would apply to a subspecies of a species that is demonstrably secure globally (G5) but the subspecies warrants a rank of T1, critically imperiled.

STATE RANK: The following ranks are used by the Virginia Department of Conservation and Recreation to set protection priorities for natural heritage resources. Natural Heritage Resources (NHRs) are rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The criterion for ranking NHRs is the number of populations or occurrences, i.e. the number of known distinct localities; the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals; the quality of the occurrences, the number of protected occurrences; and threats.

- **S1** - Extremely rare; usually 5 or fewer populations or occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.
- **S2** - Very rare; usually between 6 and 20 populations or occurrences; or with many individuals in fewer occurrences; often susceptible to becoming extirpated.
- **S3** - Rare to uncommon; usually between 21 and 100 populations or occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
- **S4** - Common; usually >100 populations or occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.
- **S5** - Very common; demonstrably secure under present conditions.
- **SA** - Accidental in the state.
- **S#B** - Breeding status of an organism within the state.
- **SH** - Historically known from the state, but not verified for an extended period, usually > 15 years; this rank is used primarily when inventory has been attempted recently.
- **S#N** - Non-breeding status within the state. Usually applied to winter resident species.
- **SR** – Reported for Virginia, but without persuasive documentation that would provide a basis for either accepting or rejecting the report.
- **SU** - Status uncertain, often because of low search effort or cryptic nature of the element.
- **SX** - Apparently extirpated from the state.
- **SZ** - Long distance migrant, whose occurrences during migration are too irregular, transitory and/or dispersed to be reliably identified, mapped and protected.
- **NA** – Not Applicable- A conservation status rank in not applicable because the species is not a suitable target for conservation activities.

These ranks should not be interpreted as legal designations.

Appendix B – Responses to Public Comments on the Wells Branch Project

Seven comment letters and one phone call were received as part of the original scoping process. Three additional letters and one phone call were received as part of the second scoping period. The release of the draft EA in October, 2011 drew numerous e-mails from local community members as well as others. Comments were received from:

Commenter 1: Clinch Coalition

Letter 2: Dated September 8, 2007, representing Virginia Forest Watch (VAFW), Southern Appalachian Biodiversity Project (SABP), and the Clinch Coalition.

Commenter 2: Virginia Forest Watch

Letter 3: Dated September 7, 2007, representing VFW, Sierra Club-Virginia Chapter, and the Clinch Coalition.

Letter 4: Dated September 10, 2007, representing VFW, and the Clinch Coalition.

Letter 5: Dated September 7, 2007, representing VFW, Sierra Club-Virginia Chapter, and the Clinch Coalition.

Letter 10: Dated June 28, 2010, representing VFW, Sierra Club-Virginia Chapter, and the Clinch Coalition.

Commenter 3: Wild South

Letter 8: Dated June 22, 2010, representing Wild South, VFW and the Clinch Coalition.

Phone call and e-mail: received week of 6/22/2010, representing Wild South.

Letter 11: dated (no date) October, 2011.

Commenter 4: Commonwealth of Virginia

Letter 1: Dated September 5, 2007, representing Department of Conservation and Recreation.

Letter 6: Dated August 14, 2007, representing Department of Environmental Quality.

Letter 7: Dated September 14, 2007, representing Department of Historic Resources.

Letter 9: Dated June 28, 2010, representing Department of Conservation and Recreation.

Commenter 5: Rick Gillenwater

Phone call received on 8/15/07, representing him and family.

E-mailed commenter's October, 2011

Seventeen separate e-mails were received (by the district ranger) from individuals both in the local community and from other parts of the country. The Clinch Coalition website and an e-mail to interested publics advocated points be sent as comments on this project that were found in many of the comments received. These comments are appreciated and were all reviewed. Responses to the comments are consolidated to include all the similar themes. Since these comments originated from e-mail, full names and addresses are not known and will not be included in this section.

The letters were all multi-page documents and many contained numerous questions and comments that were not site or project specific. They could have applied to any timber sale on federal lands. Still, these general comments are appreciated as are the e-mails, phone calls, and site specific comments related directly to the proposed action.

Many of the comments and concerns expressed in these letters and e-mails were repeated within the same letter and among the letters. As a result, for analysis purposes, some comments were paraphrased and addressed as a general concerns (most often shared among letters). The project file contains the original letters with comment numbers next to each comment.

Comment #1: *It is a gross overgeneralization to list all 2900 acres of the project area as oak hickory forest greater than 70 years old.*

Response: The interdisciplinary team (ID team) recognizes the presence of many different forest types (and ages) in the project area. Oak hickory forest greater than 70 years old is however the dominant forest type in the project area. It is one of the agency's goals to increase the diversity of ages and, to a lesser extent, species composition within the project area to create a "mosaic" of different habitats for wildlife. **Non-project issue**.

Comment #2: *The Land and Resources Management Plan: Jefferson National Forest lists the rotation ages for regeneration harvest in cove hardwood forests in the management prescriptions into which the proposed treatment areas fall at 100-120 years for management prescription 8A (p. 3-115) and at 120-180 years for management prescription 7B (p. 3-90). Since the forest in question has reached neither of these ages, management must be confined to single tree selection or to small group selection (no greater than 0.75 acres in size).*

Response: This project will adhere to the Land and Resources Management Plan guidance for rotation ages (as well as other management issues). Limiting harvesting to single tree selection or to small group selection (un-even aged management) would not allow the objectives pertaining to early successional habitat and structural diversity to be fully met. Single tree and group selections also require frequent stand entries which have the potential to impact soil and aquatic resources more than the even aged management proposed. **Non-project issue.**

Comment #3: *The Final Environmental Impact Statement for the Revised Land and Resources Management Plan: Jefferson National Forest (p. 3-270) lists the mean fire return interval for mixed mesophytic forests as 80-200 years and the acres expected to be burned annually at 0-10 acres . . . Whether the cause of the fire was a prescribed or natural burn, the areas in question have already been burned and should not be burned for another 80 to 200 years.*

Response: The Forest historically burned much more often than it has since widespread fire suppression began in the 1930's or so. The ridges burned more frequently than the mesophytic forests in the coves and stream bottoms. It is however impractical to separate the ridges from the bottoms during prescribed burns. In many cases a prescribed burn will go out when it hits a mesophytic forest creating a mosaic of burned and un-burned acres. See section 2.1.3 (page 15) of the EA for some discussion on the management objectives of prescribed burning. **Non-project issue.**

Comment #4: *We recommend that a thorough plant community analysis be conducted of the entire area proposed to be managed before plans are made on the site.*

Response: Thorough plant community analyses were conducted in the project area before plans were made on the site. Trained foresters as well as botanists and biologists conduct separate surveys before any prescriptions are developed. See the biological evaluation in the EA (page 74) for a discussion on field surveys and results. **Non-project issue.**

Comment #5: *We recommend that the prescribed burn be kept away from the site marked in Figure 2 in order to prevent damage to heritage resources.*

Response: An archeological survey was conducted for this project and all of the archeological sites that were documented will be protected from ground disturbance. Fire generally does not affect archeological resources. The site marked in figure 2 is in a rock cliff area that is not vegetated and will not burn. **Non-project issue.**

Comment #6: *We recommend that prescribed burning not be allowed to enter the Management prescription 4D area surrounding Lake Keokee.*

Response: *The Revised Land and Resource Management Plan: Jefferson National Forest* states that . . . "Prescribed fire, wildlife habitat improvements, domestic livestock grazing, integrated pest management, and occasional low intensity timber harvest are appropriate management tools to maintain the long-term goals of the desired condition in these areas related to the improvement of threatened, endangered, sensitive, and locally rare species habitat." (pg. 3-27 RLRMP). In fact, fire is beneficial to many of the botanical species protected within these areas. **Non-project issue.**

Comment #7: *We strongly recommend that no activities beyond the removal of invasive species and upgrade of recreational resources be undertaken in management 7B.*

Response: The scenery around Lake Keokee is highly valued by the ID team and the public. As a result the visual character of the area was a primary consideration in developing the alternatives outlined in the EA. The scenic Integrity objectives for the area were considered and will be adhered to. More discussion on Visuals and Scenery Management can be found in the EA on page 66 **Project issue.**

Comment #8: *Researchers have found that logging, road building, and other similar activities create the conditions in which invasive can thrive.*

Response: The ID team recognizes the potential for logging and road building to spread invasive species. As a result, mitigations including chemical and manual treatment of invasives are included as part of this project. See Projects associated with alternative 2 on page 20 of the EA. **Non-project issue.**

Comment #9: *We recommend that Japanese Stilt Grass and other invasives be thoroughly eradicated before any other proposed management activities begin.*
Response: This is a good idea, treatment of NNIS is a high priority, but may be impractical because invasives are extremely difficult (if not impossible) to completely eradicate from a large project area such as this one. NNIS control efforts are ongoing and will take place before, during, and after the timber harvests proposed. **Non-project issue.**

Comment #10: *We object to all of the new road construction and reconstruction described in the scoping notice.*

Response: New road construction is not taken lightly and the ID team explored other options to access the stands proposed for management actions. A roads analysis was completed to determine this need (See project file). Road maintenance is important to control erosion and reduce sediment coming off roads into streams. The effect of road construction and maintenance and logging infrastructure constructions were analyzed in relation to their impact on water quality, and riparian and aquatic resources. **Project Issue.**

Comment #11: *Please consider how additional roads will only increase illegal ATV traffic*.

Response: Illegal ATV traffic has been identified as a problem in the project area. The ID team recognizes the importance of controlling Illegal ATV use in the project area and on the rest of the district as well. Logging slash will be placed on skid roads to discourage illegal ATV use within cutting units. Considering this design feature and with increased monitoring by law enforcement the ID team believes that additional roads will not significantly increase the amount of illegal ATV use in the project area. The new system road will be closed to motorized vehicles during construction and after completion. **Non-project issue.**

Comment #12: *Disclose the current and proposed Open Road Density in the general area including the analysis area.*

Response: A roads analysis has been completed for this project and can be found in the Wells Branch Project File. **Non-project issue.**

Comment #13: *Please identify all TES species and their habitats which may be affected by the proposed management activities.*

Response: This information is included in the Biological Evaluation section of the EA and is procedural in nature. **Non-project issue.**

Comment #14: *The forest service must follow through on its responsibility to design and implement conservation strategies for sensitive and other species of concern.*

Response: TES and MIS species as well as other sensitive species and species of concern were all considered during the development of this project. The Biological Evaluation in the EA analyzes and documents the effect of the project on many different types of species. This was identified as a **project issue** in the development of the proposed actions in this project.

Comment #15: *We are particularly concerned about wildlife which depends on larger tracts of unfragmented native forests.*

Response: The fragmentation of forests (mature or not) is an issue that the FS considers at the Forest Plan level. In general, fragmentation of the forest occurs when a land-use is permanently changed from a forested environment, not when timber harvesting occurs. This project does not change any land use and is within the guidelines set forth by the Forest Plan. **Non-project issue**.

Comment #16: Please *disclose the population trends of the TES species which have population in the analysis area and disclose the methodology for determining population trends.*

Response: Population trends for TES species are analyzed at the Forest level; therefore a project-specific population trend analysis for each species will not be performed. Potential effects to TES species are disclosed and addressed in the BE for this project. **Non-project Issue.**

Comment #17: *It is an absolute necessity that thorough surveys for Proposed, Threatened, Endangered, and Sensitive species and management indicator species be conducted before NEPA documents are finalized.*

Response: This comment is procedural in nature. Surveys and analysis conducted for this project meet agency standards for projects of this scale. **Non Project Issue.**

Comment #18: *If population monitoring data does not exist for TES species, the Forest Service must do surveys to gather this information.*

Response: Population data exists at the Forest level and were considered in the BE for the project. **Non-project issue.**

Comment #19: *We specifically request that the analysis address the related issues of "population viability" and "distribution throughout its geographic range" in regards to all species of concern.*

Response: Effects to TES species and populations were addressed in the BE/BA for this project. Effects to MIS species were addressed in the EA. Established procedures will be followed. **Non-project issue.**

Comment #20: *We request that the Forest Service provide copies of the field survey forms used when surveys were performed for TES species.*

Response: Field Survey data used in the development of this project is available at the Clinch Ranger District Office upon request. **Non-project issue.**

Comment #21: *The analysis should be expanded to include a cumulative effects analysis area that would include a truly viable population.*

Response: Cumulative effects analysis is standard procedure during the Environmental Assessment process. Cumulative effects analysis areas vary by the species being discussed and are determined by professional opinion of agency biologists or by agreements with the US Fish and Wildlife Service. **Non-project issue.**

Comment #22: *Please disclose effects of all alternatives on herbaceous communities.*

Response: Herbaceous communities have numerous species that will each respond differently to management activities. In general however opening the canopy combined with prescribed burning will increase the health and vigor of herbaceous communities. See the Biological Evaluation in the EA for discussion on the effects to individual herbaceous species. **Non-project issue**.

Comment #23: *Please disclose how all alternatives would affect salamander populations*

Response: Effects to TES and locally rare salamanders are addressed in the BE. Non TES salamanders do not require detailed analysis. This is procedural in nature. **Non-project issue.**

Comment #24: *Please disclose the methodology used to determine whether or not Cerulean warbler habitat or populations exist in the planning area and the methodology used to determine the effect of the project on the viability of the cerulean warbler.*

Response: Cerulean warblers are a locally rare species on the GW/Jeff NF. Effects to Cerulean warblers are disclosed in the locally rare section of Chapter 3 in the EA. Procedurally, viability is not addressed for locally rare species because they are generally known from many locations across several states. **Project Issue.**

Comment #25: *Please disclose what bats may be present in the planning area, the effects of all alternatives on these ecologically important species, and the methodology for assessing bat populations (including the Indiana bat).*

Response: Effects to TESLR bats are disclosed and analyzed in the BE and EA for this project. Population data for listed bat species is maintained at the forest level. **Project issue.**

Comment #26: *Please disclose how alternatives will impact bear denning and vulnerability to poaching?*

Response: Effects to bears are addressed in the MIS section of the EA in Chapter3. This comment is **Procedural in nature.**

Comment #27: *Please disclose methodologies and all data and results for streams that could be impacted by the project.*

Response: Methods are generally disclosed in the EA. See Stream Chemistry and Health on pages 25-45 of the EA. Data is available by request**. Non Project issue.**

Comment #28: *Please disclose how each alternative will affect sediment levels in streams and how these sediment levels will affect population of TES fish, mussels, or other aquatic species.*

Response: See Stream Chemistry and Health on pages 25-45 of the EA. Disclosure of effects are commensurate with the degree of effect. Effects are discussed quantitatively in the EA, BE and supporting documentation using units of measure deemed appropriate. **Project Issue.**

Comment #29: *Please identify any rare ecological communities in the planning area and protect these areas.*

Response: Rare ecological communities are recognized as an important resource by the ID Team. Surveys were conducted for these areas and they are protected in all of the alternatives for this as well as any other project implemented on the Clinch Ranger District. **Non-project issue.**

Comment #30: *We specifically request that you "express habitat objectives, outputs, and effects in quantitative terms using . . . Habitat capability . . . (and) Acres for all Management Indicator Species.*

Response: MIS is discussed in Chapter 3 of the EA for this project under established guidelines. **Procedural in Nature.**

Comment #31: *We request that you "Consider for selection (as MIS) all Sensitive specie in the project area. This means not just taking for granted that those listed in the Forest Plan are the only appropriate MIS."*

Response: MIS were selected in the Forest Planning process for the Jefferson NF. MIS were selected because they reflect the vast majority of habitats available on the NF. **Procedural in Nature.**

Comment #32: *Please complete on the ground surveys for snag and downed woody material in the project area and in the cumulative effects area and disclose these results in the NEPA document.*

Response: Snags and downed woody material is recognized by the ID team as important to the forests natural processes. Surveys are conducted for snags and downed woody material as a part

of the fire/fuels program on the district. In an attempt to keep the NEPA document manageable this information will not be discussed in the EA. **Non-project issue.**

Comment #33: *Include the impact to native species (such as young turkeys) from the fire ants that may accompany the proposed activities.*

Response: There is no part of the proposed action that could result in fire ants entering the project area. **Non-project Issue.**

Comment #34: *No thinning, logging or road building should be permitted in ephemeral or other headwaters, watersheds etc. that feed into any Wild and Scenic River in our National Forest System.*

Response: There are no designated wild and scenic rivers in or near the project area. The nearest river identified as eligible to be considered for designation as part of the National Wild and Scenic River system (Roaring Branch) is in a different watershed and no ground disturbing activities are proposed in that area. **Non-project issue.**

Comment #35: *The watershed above and around waterfalls should be designated special management areas. Any decrease in water flow could very well wipe out the viability of very sensitive and rare species that live only in these spray zones.*

Response: Any "spray zones" that exist in the project area would be protected by the stream protection zones required by best management practices as well as the Forest Plan. The ID team also feels that a decrease in water flow related to the proposed action is unlikely. **Non-project issue.**

Comment #36: *Watershed Restoration***.** *If the FS identifies any erosion problems within the watershed on National Forest lands, we may be able to contribute financial resources and labor to correct the problem.*

Response: The ID team feels the entire project will result in *watershed restoration. The road maintenance (see comment #10) planned is primarily to correct erosion problems. We appreciate the offer of help to restore this watershed.* **Non-project issue.**

Comment #37: *Disclose the areas of unstable and highly erosive soils which would result in mass movement and erosion.*

Response: A soils analysis is a standard part of the analysis and is taken into account in developing all alternatives. The full soils report can be found in the project file. Soils information can also be found in the Soil Survey for Wise County. **Non-project issue.**

Comment #38: *Analyze how much soil compaction and surface erosion has occurred in the proposal area because of past actions and what the likely increases will be for the alternatives proposed.*

Response: Past and proposed practices that are contributing to soil degradation are addressed in the Cumulative Effects discussion of the EA and BE/BA. A detailed soils report was prepared for this project and is available upon request. **Non-project issue.**

Comment #39: *We would like to see a thorough discussion of the BMP's and mitigation measures you would propose.*

Response: The forest plan contains standard BMP's required during any management action on the Forest. In addition, the EA contains some mitigation measures specific to the Wells Branch project (see page 20). **Non-project issue.**

Comment #40: *Forest Regeneration – Please analyze soils, habitat types, slopes, aspect, etc. for this project, so that there would be assurance of successful regeneration and please disclose the regeneration success level from past harvesting.*

Response: Soils, habitat types, slopes and aspect are all important considerations when determining which stands to regenerate. All of these factors and more are taken into account when regenerating stands. Regeneration quantity has not been a problem in the past in this area. Regeneration quality has been an issue and has been addressed through the implementation of Timber Stand Improvements to manipulate species composition. **Non-project issue.**

Comment #41: *Please identify any known areas which contain old growth or forests developing old growth characteristics.*

Response: Old growth is a forest distinguished by age and related structural attributes. In June, 1997, the Regional Forester issued 'Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region'. Copies of stand descriptions (including old growth characteristics) are included in the project file and in the FSVEG database. Old growth is an issue considered by the ID team and discussed in the EA. There are many areas within the project area (primarily recreation, cove, and upland riparian areas) in which management activities are not planned now or in the foreseeable future. Many of these stands are nearing 100 years old. In fact, Old Growth objectives will be met by the year 2020. In addition, there are no 6A, 6B, or 6C (old growth prescriptions, see Forest Plan) areas designated within the project area. As a result, this issue was considered but, not carried forth in detailed analysis. **Non Project issue.**

Comment #42: *We urge the Forest Service to protect any and all areas with old growth characteristics or high potential for old growth restoration. Please disclose what methods were used to determine the presence or absence of old growth in the planning area.*

Response: See response to #41 above. **Non Project issue.**

Comment #43: *Jack Ward Thomas stated that " . . . the best probability of success is to preserve all remaining old growth and, if possible, produce more." Please address this statement . . .*

Response: See response to #40 above. The recreation, riparian , and upland areas that are protected in this proposed project will presumably become old growth once they begin to develop old growth characteristics in the future. In addition, areas that are difficult to access as well as areas simply chosen to be left alone for this project all have a chance to reach an old growth structure. There is no reduction of old growth proposed in this project area. **Non Project issue.**

Comment #44: *Please provide studies that show how manipulated forest systems contribute to better forest health in the long run.*

Response: The advantages of managing forest stands are well documented. Specific reasons for this project are addressed in the purpose and need section of the EA (page 8). **Non Project issue.**

Comment #45: *Please disclose the precise criteria used to designate old growth and measure and disclose the sizes of old growth stands in the areas.*

Response: See response to #'s 41-43 above. **Non Project issue.**

Comment #46: *Please tell how much habitat each block provides for interior old growth dependent species.*

Response: A discussion of the needs of forest interior species is provided in the MIS discussion in relation to wood thrush.

Comment #47: *We are requesting the Forest Service analyze the effects of the proposed project activities on biological corridors.*

Response: Biological corridors were analyzed and are left in this proposed action in sufficient quantity to provide for wildlife movement throughout the project area. **Non Project issue.**

Comment #48: The continued fragmentation of forest also needs to be a major analysis issue for the proposed logging and road building project.

Response: see response to comment # 15. **Non Project issue.**

Comment #49: *Disclose how past management actions of this sort have extirpated or significantly reduced any plant or animal species from the analysis area. Disclose how combined past management actions have affected or reduced the diversity of habitat types in the analysis area, the forest and the region.*

Response: Past actions in and around the project are taken into account as part of the cumulative effects analysis. We have no data indicating that any species has been extirpated or are in decline in the project area. Past actions in the rest of the Forest and region are outside of the scope of this project. **Non Project issue.**

Comment #50: *We ask that this project include a full economic analysis that includes the following valuations: [1 thru 12]*

Response: The Forest Service fully recognizes values other than the economic value of timber. Our economic analysis includes only things that can be adequately valued in dollar terms (and can be found in the project file). To value things like quality of life of neighboring communities, and pest control services provided by species that prey on agriculture and forest pests is problematic and any attempt to put a dollar amount on non-monetary services would be impractical since no standardized methodologies are available. **Non Project issue.**

Comment #51: *Logging National Forests exacerbates adverse changes in global climate by reducing the carbon absorption function of National Forests and by releasing carbon stored in these forests into the atmosphere.*

Response: Not all of the carbon stored in harvested trees is released into the atmosphere. Some carbon ends up in the final products created with these trees (flooring, furniture, lumber etc. . .). Furthermore, actively growing trees (and herbaceous vegetation) absorb more carbon than sedentary old trees with little herbaceous growth in the understory. Global Climate change is addressed as best as possible in the EA (page 70). **Non Project issue.**

Comment #52: *Please address how the proposed projects may increase future restoration expense by further degrading area watersheds.*

Response: Please see the response to comment #36. It is not our intention to "degrade area watersheds" during implementation of any of our proposed actions in this or any other project. To the contrary, this project is intended to restore watersheds to a more healthy condition. **Non Project issue.**

Comment #53: *We request that cumulative effects be a major focus of your analysis.*

Response: Please see the response to comment #48. Cumulative effects are a major focus of our analysis of proposed alternatives. This is procedural in nature. **Non Project issue.**

Comment #54: *We request that your cumulative effects analysis include in detail both the suppression of wildfire and the use of controlled burns today . . . and please disclose in the NEPA document what the historic, natural, pre-management fire regime was in the analysis area.*

Response: The cumulative effects analysis does include wildland fire and controlled burns. Please see the response to comment #3 in regards to fire regime's in the project area. Fire is discussed to some extent in the NEPA document; Historic fire regimes are also discussed in detail in the Forest Plan and were determined using the best available science. This science led to the development of standards and guidelines for management of fire in the project area. Controlled burns are an accepted management practice to meet specific management objectives. **Non Project issue.**

Comment #55: *Please disclose the cumulative effects analysis area to be utilized.*

Response: Cumulative effects analysis areas vary according the resource/issue in question. **Non Project issue.**

Comment #56: *We ask that you take your cumulative effects analysis to the regional level.*

Response: Established FS protocol does not require taking cumulative effects analysis to the regional level. Management actions and events that take place in other parts of the region are outside the scope of this project. **Non Project issue.**

Comment #57: *Please provide maps and other documentation on past logging and burning activities, including such information as year and regeneration success level for each past activity in the analysis area and in the cumulative effects area.*

Response: Most of the information that you are requesting (for FS land) is available through our stands data that is kept in the FSVeg database. The same information may or may not be available for the private lands in the cumulative effects area. **Non Project issue.**

Comment #58: *Please disclose the cumulative impacts of motorized on and off-road travel on wildlife, soils, water quality, and biodiversity that will occur when logging takes place.*

Response: On and off-road vehicle impacts are considered in the cumulative effects analysis to the extent that they can be quantified. **Non Project issue.**

Comment #59: *Roaring Ranch Conservation Site has been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resource of concern at this site is: Swainson's Warbler (Limnothlypis swainsonii)*

Response: Swainson's Warbler is a Locally Rare species and is addressed in biological evaluation in the EA for this project. **Non Project issue.**

Comment #60: *Also, according to the information currently in our files, this site is located within the Lake Keokee-Laurel Fork Divide Conservation Site and has been given a biodiversity significance ranking of B3, which represents a site of high significance. The natural heritage resources of concern at this site are:*

Small whorled pogonia (Isotria medeoloides)
Small spreading pogonia (Cleistes divaricata var. bifaria)

Response: Small whorled pogonia and Small spreading Pogonia are both addressed in the biological evaluation in the EA for this project. **Project issue.**

Comment #61: *We, as members of the public have no choice but to assume that logging, road building, prescribed burning, road work, site preparation activities, and all other types of*

ground disturbance and habitat manipulation are contemplated or likely in every single acre, of this 4000 acre project area.

Response: There is no basis for this assumption. The scoping notice and draft EA provided to the public provides details about how much logging, road building, prescribed burning, road work, site preparation etc . . . are planned in this project area. **Non Project issue.**

Comment #62: *The FS must address the significant risks and unknown (undisclosed) risks of a project of this nature by preparing an Environmental Impact Statement.*

Response: An environmental impact statement is prepared only if the environmental assessment indicates adverse effects may occur from the project's management actions. This is procedural in nature. **Non Project issue.**

Comment #63: *We ask that the public be provided with another legal notice comment period in which to comment, before the decision is made, once the full details of this project are known by the FS.*

Response: In this case the public will be provided with another legal notice comment period after the draft EA is released. **Non Project issue.**

Comment #64: *This project implicates many of the legal violations committed by the Revised Jefferson National Forest Plan and its Final Environmental Impact Statement and explained at length in the two administrative appeals of that Revised Plan and FEIS filed by conservation groups.*

Response: This comment is directed more towards the Forest Plan rather than the project itself. The forest plan has been approved and will be adhered to in the implementation of this project. Outside the scope of this project. **Non Project issue.**

Comment #65: *During the forest planning process the Forest Service failed to properly evaluate and consider areas for recommendation as potential wilderness areas.*

Response: See the response to comment #64 above. Outside the scope of this project. **Non Project issue.**

Comment #66: *The roadless inventory and evaluation for the Jefferson National Forest Plan revision is arbitrary and capricious and violates the APA, NEPA, the NFMA regulation, and the Forest Service Handbook.*

Response: See the response to comment #64 above. **Non Project issue.**

Comment #67: *Roadless Area (Roaring Branch area) should be properly analyzed, inventoried & protected.*

Response: See the response to comment #65 above. In addition it should be noted that no ground disturbing activities are planned in the Roaring Branch area. **Non Project issue.**

Comment #68: *The Appalachian national forests, and many of the Appalachian roadless areas, lie at the headwaters of the eastern watercourses and provide drinking water, fisheries, and aquatic diversity for much of the heavily populated east. It is critical that we protect these watersheds to the highest degree possible.*

Response: The ID team recognizes the importance of the Jefferson National Forest (and others) for "drinking water, fisheries, and aquatic diversity for much of the heavily populated east." **Project Issue.**

Comment #69: *Implementation of the proposed cutting and road building would result in harmful edge effects and forest fragmentation and disturbance that will degrade wildlife populations and natural ecological processes and conditions in the roadless/unroaded area.*

Response: See the response to comment #15 regarding forest fragmentation. "Natural ecological processes and conditions" include disturbances such as wind, ice, and fire events that create edge effects. In fact, edge effects are beneficial to many species. **Non Project issue.**

Comment #70: *The FS should analyze the impacts of logging on sensitive soils and steep slopes.*

Response: See the response to comment #37. Sensitive soils and steep slopes are a concern of the ID team and were considered when developing the proposed actions for this project area. Analysis was done and soil mitigation measures will be implemented. **Non Project issue.**

Comment #71: *The FS routinely allows logging in wet and muddy conditions and describes this as a "fairly common" Practice.*

Response: This statement is inaccurate and, in fact, the reverse is true. The FS routinely **shuts down** logging activities in wet and muddy conditions. Out of curiosity I located the letter from which this statement was derived and found that the response letter [from Cindy Schiffer, dated March 24, 2006] stated that "it is fairly common for landings and surrounding areas to become rutted during logging operations". It went on to say that "that's why we are careful where we locate these areas of concentrated use. The rutted areas you observed were bladed and smoothed out after the area dried up enough to permit operations". **Non Project issue.**

Comment #72: *The FS should fully analyze the impacts to this area [roaring branch] and fully protect the values of the corridor and the waterway. Because this is an eligible wild river, it should be accorded a greater degree of protection, and should receive a much higher level of analysis than other waterways and eligible W&S rivers.*

Response: See the response to comment #67 above. **Non Project issue.**

Comment #73: *The FS should disclose whether this project could impact any karst areas, caves, cave openings, blowholes, sinkholes, or other above-ground or below-ground features related to karst and limestone areas.*

Response: A soil survey is completed to disclose and protect and sensitive soil areas above ground. Below ground features are also considered where known, but are generally not affected by the projects proposed in this EA. **Non Project issue.**

Comment #74: *We are concerned that after the project is complete, skid trails and other logging infrastructure will remain a long-term source of sediment and contaminants that cannot be mitigated.*

Response: Skid trails and other logging infrastructure are promptly re-vegetated with a wildlife seed mix. This vegetation controls erosion and provides browse for wildlife in the short-term. Long term more natural vegetation occupies the impacted areas and sediment levels return to pre-harvest levels or near pre-harvest levels. Water quality can be effected by logging infrastructure and is a **project issue**.

Comment #75: *Local citizens, including thousands in the Clinch Coalition, are concerned about the visual impact of national forest logging in projects of this nature.*

Response: The aesthetics of timber sales are always a consideration when the FS analyses a project. In addition, the forest plan identifies specific scenic integrity objectives and scenic classes. An analysis of the visuals of the project area was completed and concluded that all activities in the project area met the standards set forth in the SMS. This issue was considered but not carried forward in detailed analysis. See page 66 in the EA for a discussion on Visual/Scenery in the project area. **Non Project issue.**

Comment #76: *We are particularly concerned that portions of this project area and vicinity were assigned unacceptably low scenic integrity objectives and scenic class categories in the JNF plan.*

Response: The scenic integrity objectives for this project area are set in the forest plan and are outside the scope of this project. Scenery issues are also discussed in the response to comment #75 and in the Ea on page 66. **Non Project issue.**

Comment #77: *It is not clear how the Forest Service ensures that permitted activities in Low SIO areas (and other SIO areas) can and will be "shaped and blended to the extent practicable with the natural terrain" as required by NFMA.*

Response: There are a number of ways to reduce the impact of management activities on scenery. Straight lines are minimized and basal area can be "feathered" from high to low basal area along the edges of units. In addition, buffer strips and/or leave areas can be incorporated to reduce visual impacts. **Non Project issue.**

Comment #78: *The extensive clearcutting, coppice logging, seed-tree logging, modified shelterwood logging, sanitation logging, salvage logging, shelterwood logging, removal cutting, and road building permitted in Low SIOs, and other SIOs in the plan will be highly visible and significantly degrade scenery and our enjoyment for decades.*

Response: see response to comment #76. **Non Project issue.**

Comment #79: *Why not eliminate cut and fill logging roads altogether? Or why not fully decommission all such roads, using full recontouring?*

Response: It is not feasible to eliminate cut and fill logging roads altogether in mountainous terrain. In order to manage the forest access is critical and some cut and fill is necessary to build roads on most of the areas found within the project area. We do attempt to minimize cut and fill road building. Decommissioning all roads using recontouring is also not feasible. Temporary roads are closed and revegetated; culverts removed etc . . . System roads are all constructed with the intent to use them in the future so recontouring is not desirable. **Non Project issue.**

Comment #80: *The agency must formally consult with the USFSWS on this specific project.*

Response: Consulting with the USFSWS was a part of the planning process. **Non Project issue.**

Comment #81: *Clean water flowing from the project area is critical to the mussel population downstream because of mussels' sensitivity to water degradation.*

Response: Water Quality has been deemed a **Project issue** by the ID team.

Comment #82: *The FS should analyze whether within-stand ESH (of any size) and grass/forb habitat (of any size) exists or is occurring as a result of natural disturbance or other activities and events.*

Response: Within stand ESH does occur due to natural (and other) events and is considered during the analysis of the project area. The number of acres of within stand ESH however is not sufficient to meet the purpose and need for this project. Within stand ESH was included as part of the existing 0-10 year habitat within the project area since no stands have been cut in the project area during the last 10 years. **Non Project issue.**

Comment #83: What conflicts with hunting, recreation, fishing, and wildlife do existing/planned roads create?

Response: Roads are generally favorable for hunters, hikers, birdwatchers, and fishermen because they provide access to the areas they use. Most trails on the Clinch Ranger District are located on old roads or rail lines. Any negative conflicts that arise due to traffic on the roads are temporary (limited to the time that management actions are on-going). **Non Project issue.**

Comment #84: *The FS should also examine alternatives that may be lighter on the land than industrial logging, include all horse logging, cutting over very long rotations (200-300 years) in this area, using only individual tree selection logging.*

Response: The Forest Service has and does consider lower impact alternatives. All horse logging is not economically feasible for large project areas such as this one. Rotations are determined during the Forest Planning process. Individual tree selection will be used in some areas but if used exclusively it does not meet the ESH goal set forth in this project. **Non Project issue.**

Responses to E-mailed Comments 10/26/2011

Comment #85: *Please step back and consider the environmental implications of the present plan and add protections for the Laurel Fork Treasure and the communities of Exeter and Keokee.*

Response: This scoping is part of an interdisciplinary approach that does consider the environmental implications of the proposed project to the areas mentioned. **Procedural in nature.**

Comment #86: *Public notice re this project demonstrated the complete lack of knowledge re the Keokee Community. The "Coalfield Progress" is not available in any area of Lee County.*

Response: The Coalfield Progress is listed as the paper of record for projects affecting the Clinch Ranger District. In addition, information about projects is available on-line. In the future, additional notices will be considered in newspapers other than the paper of record. **Procedural in Nature.**

Comment #87: *Data about the project was not adequate enough to make site specific comments*

Response: The data provided to the public regarding this project (including maps and proposed actions) is typical of other projects on this district and others. **Non Project issue.**

Comment #88: *The only interest that the Clinch District shows is in traditional logging operations which are adversely affecting our forest resources.*

Response: See response to question #84. The ID team feels that the type of logging planned will not adversely affect our forest resources. **Non Project issue.**

Comment #89: *Old growth forests take centuries to develop and we should be doing everything to preserve any forests with old growth characteristics.*

Response: All age classes are important for forest health – not just "old growth". *It is the USFS mandate to manage for multiple uses, including old growth forest. Also* See response to #41-43. **Non Project issue.**

Comment #90: *The proposed construction of 1.1 miles of road within the boundary of the Roaring Branch Mountain Treasure which qualifies for designation as a Road less Area is truly offensive.*

Response: The proposed road construction is within an already roaded area and is not even close to the Roaring Branch drainage. **Non Project issue.**

Comment #91: *The stand on the far northwestern edge surrounds a property owner and also impacts a graveyard. That stand should not even be included. The fact that this was unknown to the forest service is especially disconcerting.*

Response: Forest Service land borders many, many tracts of private land. This fact does not exclude any of these acres from management. The graveyard has been located and flagged. It will be protected with a buffer during any harvesting activities in the area. **Non Project issue.**

Comment #92: *As Lee County residents we are especially proud of our natural resources and we want to see them protected. There should not be any logging within sight of Keokee Lake.*

Response: The ID team is also proud of the natural resources we manage. Protection of these natural resources is the number one priority of not only the ID team but the forest service in general. Visual guidelines set forth in the forest plan dictate how much logging is allowed within sight of Keokee Lake. It is anticipated that there will be very little visual evidence of logging from the Lake. Any impacts to visual resources will be short term only. Also see response to comment #75. **Non Project issue.**

Comment #93: *Any logging that threatens the ecological integrity of the Laurel Fork Mountain Treasure, the scenic beauty of Lake Keokee and the watersheds of Exeter, Keokee and the North Fork of the Powell River should not be permitted.*

Response: "Ecological integrity" is not a well-defined term. However ecological functions, scenic beauty, and watershed protection are always considered in the development of projects. This is procedural in nature. **Non-project issue.**

Comment #94: *Finally, there are too many serious concerns regarding this project to allow it to proceed as presented.*

Response: Without stating what the serious concerns are and demonstrating any adverse effects would occur from this project it is impossible to respond to this comment in a meaningful way. It is up to the district ranger and/or forest supervisor to determine if this project will proceed as presented, be altered in some way(s), or be dropped. All concerns expressed in writing to the ID team are part of the decision process. **Procedural in Nature.**

Comment #95: *I would like to see the document revised to include a thorough assessment of water chemistry impacts to Keokee Lake.*

Response: Water chemistry impacts to Keokee lake were considered during the analysis of this project. See the response to comment #97 (at the end of this appendix) for more information on water chemistry impacts to Keokee lake.

Comment #96: *The existing draft EA does not provide enough information such as road placements and prescribe burn acres to assess potential impacts to lake chemistry. Also, no maps of the proposed actions were included in the {draft} EA.*

Response: There was a map released with the draft EA. It is available at only one of the two links to the project provided on the GW/Jeff website. We e-mailed specific instructions on how to access this map {and the draft EA} and I hope you found the information you wanted. **Non Project issue.**

Comment #97: *Keokee Lake is a mountain top headwater lake that relies on its forested watershed and wetlands to filter acid rain in order for the lake to be productive for aquatic life. If the proposed actions are implemented in the Keokee Lake watershed portion of the Wells Branch unit there will definitely be negative short term water chemistry and sediment effects and possibly long term effects which have not been adequately addressed by this draft EA.*

Response: This comment generated a lengthy discussion which is included at the end of this appendix.

Comment #98: *Public notice was not provided for local community most directly affected by the project*

Response: We believe that public notice was sufficient considering that there were 3 different opportunities to submit written comments, Field work including flagging and road staking etc . . . has been occurring in the project area for about five years, and the project has been on the forests web-page and in the Schedule of proposed actions since 2007. The "newspaper of record" issue was discussed in the Response to question #86. **Procedural in nature.**

Comment #99: *Only one alternative was provided to the public dismissing potential for community input and marginalizing the ability to seek a middle ground approach.*

Response: Although only one action alternative was brought forward in the draft environmental analysis the project has undergone significant changes since its inception and following the first and second scoping periods. The Forest Service is not required to do detailed analysis if it is known that they are not feasible to implement. The ID team appreciates public input and has incorporated many of the concerns and issues raised during the two initial scoping periods into the action alternative presented in the draft environmental analysis. **Non Project issue.**

Comment #100: *True ecological restoration alternatives that could satisfy project objectives were dismissed.*

Response: All of the specific "ecological restoration" alternatives that were proposed during scoping such as cut and leave were considered by the ID team, but were dropped. Safety and

economic issues were the main reasons a cut and leave alternative was not considered in detail (as an example). **Non Project issue.**

Comment #101: *We will be watching your actions on this matter. Please consider the negative results of allowing this activity.*

Response: The ID team invites public involvement of projects occurring on public land and the analysis preformed for this environmental assessment was designed to "consider the negative results" of allowing this activity. **No Issue Raised.**

Comment #102: *As a local trail user, I am very concerned about the proposed timber sale near Keokee Lake . . . Please alters the proposed plan to lessen the environmental impact to this beautiful portion of our National Forest.*

Response: Impacts to hiking trails and the environment from this project will consist of some short term trail closures during logging activity, but in the long term the affected trails and the environment will benefit from the management activity. Equipment will be used to improve the Olinger Gap trail treadway and any logging debris on either the Olinger Gap or Stone Mountain trail will be promptly removed by the logging contractor and/or Clinch Ranger District Employees. Some trail overlooks (views) will likely be created by the logging adjacent to the Stone Mountain Trail. Blazes and signage will also be replaced/improved during the proposed management activities. Many of us on the ID team are also local trail users and avid hikers**.** **Non Project issue**.

Comment #103: *Six of the stands in the north eastern section of this timber sale consist of recent cuts that were not addressed in the EA. These recent cuts are viable for a restoration approach and the EA is misleading stating that the majority of these stands are forests that are 70-90 years old.*

Response: The stands you refer to in the north eastern section of this timber sale area were addressed in the draft EA. They were included in the 11-40 year old age class acreages (see age class distribution on page 7 of the draft EA). These stands were also mentioned in section 2.1.1. Past Actions Relevant to Current Resource Conditions. These younger stands appear healthy and growing, have had timber stand improvement work done in them, and will be ready for commercial thinning at some point in the future. They are an important part of the age class structure of the project area as some of the only young stands in the project area. We do not believe that it is misleading to state that the majority of stands in the project area are 70-90 years old. See table 1 on page 7 of the EA for a look at the age class distribution in the project area. **Non Project issue.**

Comment #104: *EA ignores loss of Hemlock and its relationship to providing early successional habitat.*

Response: The Clinch Ranger district has already released an environmental assessment that addresses the loss of Hemlock on the district. Hemlock mortality does not usually occur at such densities that its loss constitutes a stand replacement event. When hemlock dies it generally only

creates small canopy openings that tend to fill in quickly. These openings are too small to meet the requirements of Early Successional Habitat for wildlife.

Comment #105: *EA also places a disproportionate priority on creating ESH rather than supporting old growth forests.*

Response: Priority is placed on ESH in the project area because that is what the project area is lacking. Old Growth forests will happen with or without management. In order to maintain Early Successional forests (in the absence of natural stand replacing events) management is a necessity. Old Growth is also discussed in the response to questions #41 and #89. **Non Project issue.**

Comment #106: *The purpose and need for this project should have been vetted by the local community to see what portions of the proposal might involve volunteer labor, stewardship agreements, etc.*

Response: The purpose and need was "vetted" by the local community in the way of three separate public comment periods. Many ideas such as the ones you mention were proposed during these periods and were considered by the ID team to be unfeasible. ***Procedural in Nature***.

Comment #107: *Region 8 requires that every project identify and designate old growth this project fails to comply with this standard.*

Response: The ID team followed all the regional standards that we are aware of during the development of this project. The older age class stands were noted in the age class distribution analysis, but old growth is more about stand structure than actual age and identifying and designating "old growth" is not as clear cut as one might imagine. Old growth is also discussed in the response to questions 41, 89, and 105. **Non Project issue.**

Comment #108: *The age class distribution presented in the EA is incorrect. Field surveys by the Clinch Coalition show ample acreage of 11-40 year forests that had previously been logged and disturbed. There was no mention of this past activity in the EA.*

Response: The draft EA shows 336 acres of this (11-40 year old) age class in the project area. Past logging activity was also discussed. See the response to Comment #103 for additional information. **Non Project issue**.

Comment #109: *Illegal ATV use in the area is rampant as we observed first hand. The creation of more roads will only exacerbate this threat and increase the risk of accidents and resource damage.*

Response: Illegal ATV use has been noted in the draft EA. Many of the ATV trails found in the project area are user created and not on old roads or trail. ATV's have the ability to travel off-road and the local riders seem to enjoy this challenge. Also, see the response to comment #11. **Non Project issue**.

Comment #110: *The road construction that has been planned for this project extends across steep slopes at the northern section where slopes were measured at over 50%. Furthermore the road that has been laid out on the ground will be carved into the side of the slope rather than following the ridge top increasing soil disturbance and the potential for slope failure.*

Response: The proposed road construction was surveyed and laid out on the ground by an engineer with many years of experience designing forest roads. Steep slopes have been minimized although one short section on a steep side slope was un-avoidable. Forest roads are commonly designed to be "carved into the side of the slope" rather than following the ridge top in order to provide appropriate drainage. Ridge top roads tend to become entrenched and fill with rain water during storms. This water has nowhere to go and creates the "mudholes" that are common on ridge top roads. Sidehill roads are more expensive to construct, but require less road maintenance, have less visual impact, and are more serviceable than ridgetop roads. **Non Project issue.**

Comment #111: *Old-growth forests provide ecosystem services that may be far more important to society than their use as a source of raw materials.*

Response: The ID team recognizes the value of old growth as more than just a source of raw materials. See the responses to questions 41, 89, 105, and 107 for more discussion on old growth. **Non Project issue.**

Comment #112: *One of the more frustrating things for us was the lack of specific stand data (stand age, forest type, stand history, etc.) provided throughout the public participation process. It is nearly impossible to provide "site specific comments" without being provided such information.*

Response: Stand data is available to the public through the FSVeg database which has descended from the Cisc data that was referenced in conversation and letters. In addition, given the maps we provided, and open access to the project area, you are free to do site visits and gather the data you need to make site specific comments. It is our expectation that you would want to see the stands for yourself before making comments. Also see the response to comment #'s 87 and 103 for more discussion on stand information.

Comment #113: *Increasing structural diversity begets increased age class distribution and fosters and "all-age" forest which is much more resilient than even-aged stands proliferated across the landscape.*

Response: When looking at a forest from the landscape level the easiest and most reliable way to ensure structural diversity is by creating age class distribution across that landscape. While within stand structural diversity (the so-called "all-age" forest) is desirable, structural diversity across the landscape is critical to wildlife. Landscape level diversity is also much easier to quantify than canopy openings and age differences within stands. This comment illustrates that the FS shares many common goals and structural diversity is one of these shared goals. **Non-project issue.**

Comment #114: *Wholesale logging prior to FS ownership and even-aged management in modern times has left our forests in an unhealthy condition with a lack of disturbance and without the diversity of habitats that wildlife require. More even-aged management will only serve to perpetuate this imbalance.*

Response: We are in agreement when you say *" . . . has left our forests in an unhealthy condition with a lack of disturbance and without the diversity of habitats that wildlife require."* This could have easily come directly out of the purpose and need for this project. What you fail to see is that logging (when done responsibly) is a disturbance that can create the diverse conditions wildlife needs. Across large landscapes even aged management is preferred in order to minimize entries into individual stands. Un-even aged stand management requires entries into treated stands every 5 to 10 years and is not feasible in most cases. **Non-project issue.**

Comment #115: *Concentrating acreages of ESH to 40 acre stands using regeneration methods will achieve desired results in the short term but over time these areas will no longer provide the desired benefit and will result in an "overstocked" stand most likely with less "desirable" species composition.*

Response: We agree with this Comment. Responsible land management is never "done". ESH needs to be replaced as stands age and mature. Stocking and species composition are issues which can be addressed with intermediate stand treatments in the future. **No Issue Raised.**

Comment #116: *It is much more sensible ecologically to create several 1 to 10 acre openings that mimic natural disturbance events in even-aged stands than it is to concentrate all logging in one single 10-40 acre area.*

Response: This seems to be getting at even vs. un-even aged management. Smaller openings in stands are great, but require multiple entries in order to regenerate a stand. When working at a landscape level it makes more sense from a stewardship viewpoint to reduce the number of entries thereby reducing soil compaction, erosion, road work etc . . . due to these multiple entries. This is a difference of opinion in the scale of logging operations and illustrates that we have common ground to build upon. Also see the responses to questions #113, #114 and #115 for more discussion on this issue. **Non Project issue.**

Comment #117: *The silvicultural system being proposed in this project is antiquated and must be refined to escape the endless cycle of intervention required to keep these stands on a trajectory towards the Desired Future Condition (DFC)*

Response: The ID team disagrees with the idea that we are using "antiquated" silvicultural systems. We feel the silvicultural systems being implemented on this project are solid and have their basis in real science. These systems are not likely to ever become "antiquated" because decades of experience show that they achieve the desired results. **Non Project issue.**

Comment #118: *The fact that this project has been designed to target stands in excess of 100 years of age is unconscionable.*

Response: This project was not designed to target stands in excess of 100 years of age. In fact only about 35 acres of 100+ year old timber is within planned timber harvest units. These harvest units (and portions of units) were included because of attributes other than age. **Non project issue.**

Comment #119: *With a DFC of 20% late successional forest it seems contrary to "regenerate" the very stands that classify as such.*

Response: Some of your other comments indicate that you are aware that age is not the only, or even the most important, indicator of "old growth". The 100 year old stands (or rather the parts of those stands) that have been proposed for regeneration have no structural or other characteristics that distinguish them from other slightly younger stands. Also see the Response to comment #118. **Non-project issue.**

Comment #120: *The EA states that a restoration alternative was excluded from further analysis for two reasons 1) It can't be defined 2) it implies no logging. Both of these assertions are absolutely false and a phone call/e-mail to commenters who recommended this alternative could have explained not only what restoration is but also what it is not.*

Response: The ID team needs specific comments and suggestions in order to respond appropriately. All of the specific "restoration alternatives" were carefully considered by the ID team. Follow up phone calls and/or e-mails may be implemented when we are un-clear about a specific comment not to clarify non-specific comments. Also see response to comment #100. **Procedural in Nature**.

Comment #121: *Forest health objectives can be met at broader scale if single-tree selection methods are incorporated across the landscape rather than concentrating efforts in just a few stands.*

Response: Single tree selection will not meet the purpose and need for this project. Specifically, Single tree selection will not provide early successional habitat or create any kind of age class diversity. When single trees are removed only small canopy openings are created and these quickly close as competing vegetation moves in. **Non Project issue.**

Comment #122: *It is likely that prescribed burning alone can meet the majority of your objectives. Prescribed fire is an excellent tool for restoration.*

Response: The ID team recognizes the value of prescribed fire as a tool for restoration. We also feel that responsible use of fire alone will not meet the purpose and need for this project. Only stand replacing fires could provide the desired age class diversity. Also stand replacing fires generally cannot be used for management due to the increased risk of them becoming uncontrolled. **Non Project issue.**

Comment #123: *The assertion that a "cut and leave" method would result in catastrophic wildfire is unfounded and misleading.*

Response: The ID team does not assert that a "cut and leave" method **would** result in catastrophic wildfire. Cut and leave does increase fuel loading and therefore does increase the potential for catastrophic wildfire. Also see response to comment #100 for more discussion on cut and leave. **Non Project issue.**

Comment #124: *To achieve restoration and to further overcome said budgetary constraints we believe that "Stewardship Contracting" is an approach that should be considered for the Wells Branch Project.*

Response: The Clinch Ranger District has implemented a Stewardship Contract for a project in the past and will likely use Stewardship Contracting in the future. It is not clear if Stewardship Contracting will be used to implement the Wells Branch Project, but it is under consideration. **Non Project issue.**

Comment #125: *We are concerned that of all the stands in the analysis area only ten (527 acres) exceed the minimum age requirement and this project proposes to log portions of three (161 acres max) of them with a regeneration harvest.*

Response: The stands that are proposed for treatment have all been visited in the field and all meet the requirements of timber ready to receive either intermediate treatment or regeneration harvest depending on the stand. Also see responses to questions #103, #107, #108, and #112. **Non Project issue.**

Comment #126: *a 100 year cut-off is fundamentally flawed and why each of the criteria for existing old growth must be examined for every stand at or near 100 years of age.*

Response: This question is outside the scope of this project. There is plenty of discussion of Old Growth in comments and responses to questions #41, #89, #105, #107, and #119. **Outside the Scope.**

Comment #127: *Additionally, the analysis in the EA does not seem to examine the effects at all of this new 1.1 miles of road.*

Response: All of the roads in the project area (proposed or existing) have been analyzed as part of this project. Also, see response to comment #10. **Non Project Issue.**

Comment #128: *Because there is a vocal community who take pride in their landscape this project is ripe for initiating a collaborative effort to address community concerns and protect the local environment and economy.*

Response: The ID team agrees with this comment and held a community meeting on September 22, 2011 in order to address community concerns. Concerns were also expressed during two other public comment periods for this project. **Non Project issue.**

Comment #109: {we request that} a 30-day comment period be provided with the release of a final EA due to the deficiencies of the Draft EA.

Response: There will be a 30 day appeal period upon release of the final EA. **Procedural in Nature.**

Comment #97 Response:
Justin Laughlin commented:
I would like to provide my comments to you about the draft EA for Wells Branch on the Clinch Ranger District, Jefferson National Forest in Lee and Wise Counties Virginia. I have reviewed the draft EA and think it is lacking some pertinent information. I would like to see the document revised to include a thorough assessment of water chemistry impacts to Keokee Lake. The existing draft EA does not provide enough information such as road placements and prescribe burn acres to assess potential impacts to lake chemistry. Also no maps of the proposed actions were included in the EA.

I am aquatic biologist that has invested resources to improve the aquatic habitat (water chemistry & fertility) at Keokee Lake. Since I am invested in the health of the lake, I have to question the conclusion reached in the draft EA that "There will be no direct effect to Keokee Lake from implementing the proposed action". I the context of sediment yields and the capacity of the lake to hold additional solids this statment may be true, but it isn't true with regard to water chemisty. Keokee Lake is a mountain top headwater lake that relies on its forested watersed and wetlands to filter acid rain in order for the lake to be productive for aquatic life. If the proposed actions are implemented in the Keokee Lake watershed portion of the Well Branch unit there will diffinetely be negative short term water chemisty and semidment effects and possibly long term effects which have not been adequtely addressed by this draft EA. I can not support the Forest Service's objective to increase early successional habitat if those actions compromise or damage other valueable habitat such as wetlands, lakes, or streams and rivers.

I urge you to take this opportunity to perform due diligance and fully assess the environmenal impacts associated with the proposed actions on Keokee Lake and its water chemisty. Thank you for the opportunity to provide comments.

Discussion
The proposed ground disturbance of all combined road maintenance, the construction of temporary system, skid roads, and landings totals 12.6 acres of an 821 acre watershed; or about 1.5% of the area. The entire watershed is proposed for prescribed burning, and has been burned on three other occasions.
The geology of the Keokee Lake and surrounding watersheds is poorly buffered and this is reflected in the water chemistry (see hydrology effects section of the Wells Branch EA). As was stated in the hydrology specialist report for this project, Lake Keokee is a headwater lake that naturally has a trap efficiency of sediment due to the watershed size and other general physical characteristics of the reservoir; as well as a long hydraulic retention time (time a water molecule spends in the reservoir), especially during summer months when stream inputs are low. In early 2011, the Virginia Department of Game and Inland Fisheries (DGIF) limed the lake. The following paragraph is taken verbatim from the website, and illustrates the motivation and goals for the project:

> *One hundred tons of limestone dust was distributed into Keokee Lake on April 12-13, 2011 in order to increase the lake's alkalinity. This is the first step toward improving the productivity of the lake. The next step will be applying fertilizer to the lake. Fertilizer application will begin later this spring. The liming and fertilization process should boost productivity and increase growth rates for fish. Plankton will be the first to benefit from the input of nutrients through fertilization. Small fish will then eat the plankton and larger fish will eat the small fish. So, the process should benefit both sunfish (that eat plankton) and largemouth bass that eat the sunfish.*
> *(http://www.dgif.virginia.gov/fishing/waterbodies/display.asp?id=70&section=news).*

Before the liming was implemented, the lake reflected the chemistry of the contributing streams; being a nutrient-poor, poorly-buffered lake with a consequent tendency toward an oligotrophic state (see attached table). It can be reasonably inferred from the geology of the watershed that the majority of the water in the lake is derived from surface runoff. As would be expected, the ion concentrations and general chemistry of the lake water samples are very similar to the stream water samples for the project area streams (see water chemistry table in Hydrology Specialist Report). After liming, water samples from the lake show improved pH and acid neutralizing capacity (ANC) and a virtual elimination of iron and aluminum in the water column, which were present as traces in the pre-liming samples.

Analysis of the water chemistry of Laurel Fork (the next adjacent watershed to the northeast) shows that the stream showed no lasting effects from prescribed burns conducted in March of 2009 and April of 2007 (see Table in Hydrology specialist report) and the good and very good MAIS scores demonstrate a healthy, if acid tolerant macroinvertebrate community (Dawn Kirk, personal communication; fisheries specialist report, Charles Lane). Since it is reasonable to assume that Keokee's water chemistry is directly related to the stream chemistry of its contributing streams, it would also seem reasonable to conclude that the lake, even in the absence of liming, would be as resilient against any potential short term effects to its water chemistry as those streams. This was also reflected in the pre-liming lake water samples (see Table).

As the commenter is undoubtedly aware, rainwater is naturally acidic; even without anthropogenic acidification. This, coupled with the geology of the watershed, would lead to acidic conditions in the lake in the absence of any anthropogenic inputs of acid precipitation. Timber harvest activities could temporarily increase the amount of organic inputs and sediment into the lake in the short term, but seeding of the roads and landings and regrowth in the cutover areas would quickly reduce the effects to undetectable levels. Prescribed burning could temporarily increase the pH slightly, as base cations are released from ash left from the fire, but this effect is also temporary (Neary et al 2005).

A review of the scientific literature does not support the level of concern that is displayed in Mr. Laughlin's comment. Temporary, insignificant changes in water chemistry and organic inputs may occur as the result of the proposed prescribed burning and timber harvest, but no significant, lasting effect to Lake Keokee can be reasonably expected; especially in light of the fact that the VDGIF has instituted a liming program. The commenter's assertion that "*there will diffinetely [sic] be negative short term water chemisty [sic] and semidment [sic] effects and possibly long term effects which have not been adequtely [sic] addressed by this draft EA"* is not supported by the available literature, and the commenter offers no evidence other than his own opinion that the effects would definitely occur or be significant. In any event, any effects will not be of significant

magnitude to change any effects determination in the draft hydrology specialist report or merit their inclusion in the final report that will be included in the EA for this project.

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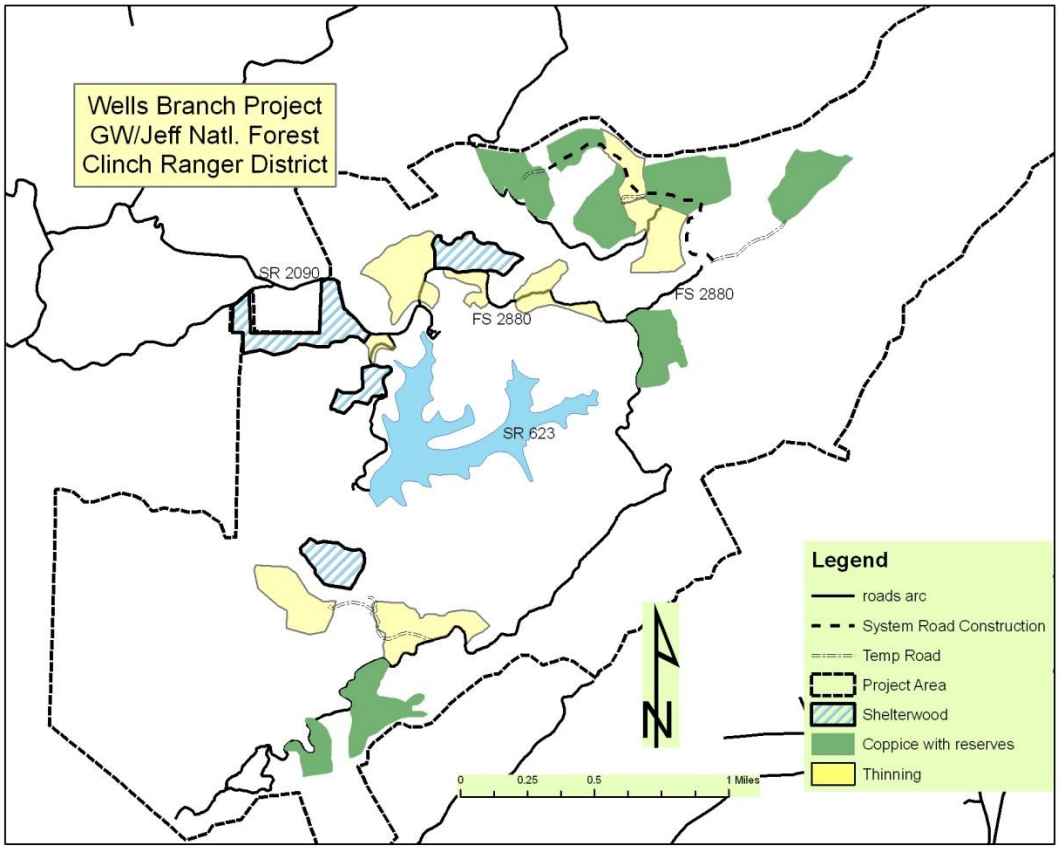
Lake Keokee 2011

Pre-liming

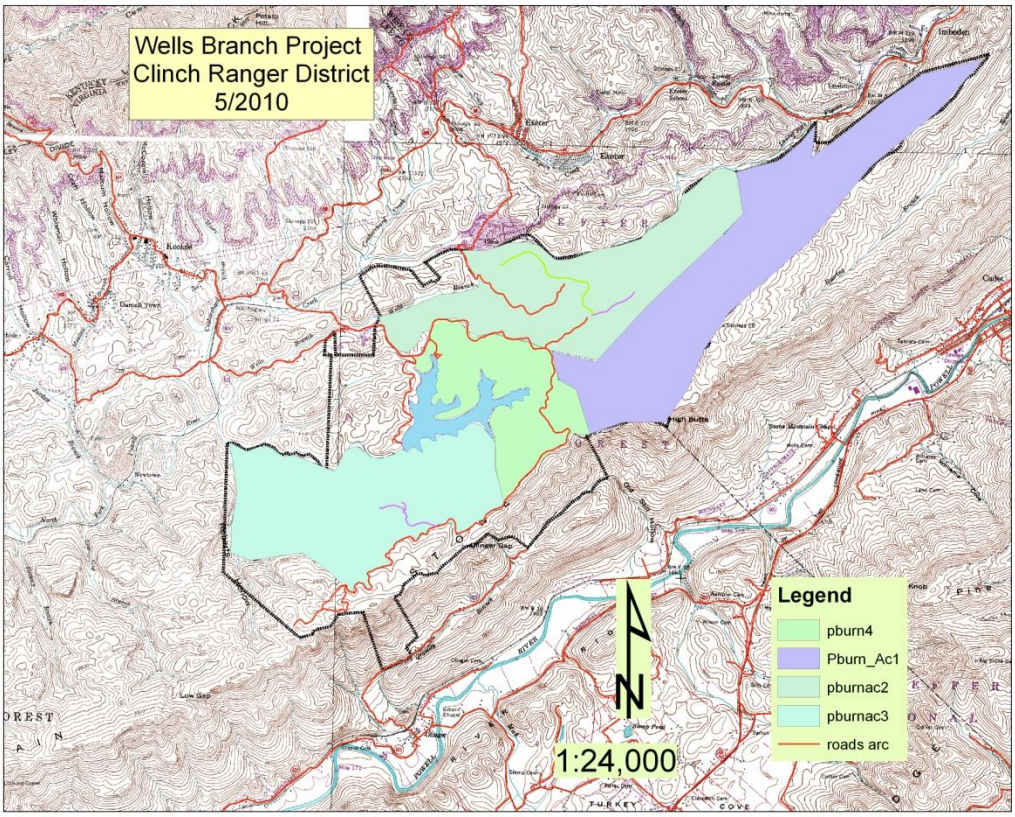
		µeq/L									ppb			
Sample ID	**pH**	**ANC**	**Ca**	**Mg**	**Na**	**K**	**NH_4**	**Cl**	**NO_3**	**SO_4**	**Al**	**Mn**	**As**	
LK1	6.38	58.0	74.6	74.5	22.4	14.9	0.9	19.4	0.3	47.5	46	49	ND	7
LK2	5.85	27.2	64.7	66.3	15.4	11.3	0.6	12.5	0.2	47.0	44	47	ND	7
LK3	6.31	40.8	63.2	67.3	15.4	12.0	1.4	12.7	0.2	46.2	44	48	ND	7
LK4	6.29	40.8	63.2	66.8	20.4	13.1	1.1	17.5	ND	46.4	44	47	ND	7
LK5	6.23	44.8	65.3	67.3	22.1	14.5	3.4	19.0	0.2	46.7	44	46	ND	7
LK6	6.26	42.1	66.8	67.2	20.1	13.6	3.7	17.1	0.3	47.7	45	48	ND	7

Post Liming

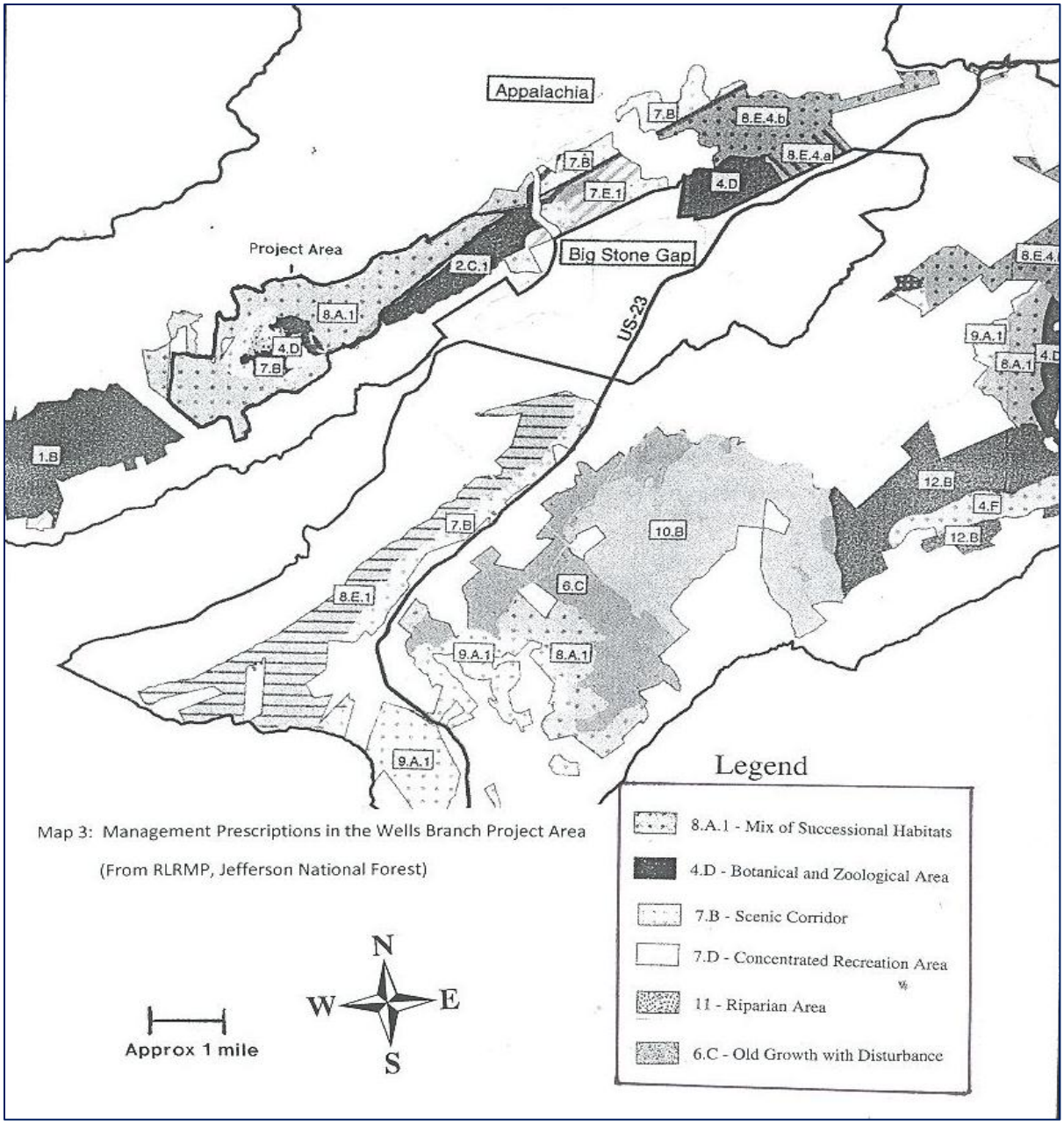
		µeq/L									ppb			
Sample ID	**pH**	**ANC**	**Ca**	**Mg**	**Na**	**K**	**NH_4**	**Cl**	**NO_3**	**SO_4**	**Al**	**Mn**	**As**	
LK1	6.90	146.6	76.0	76.0	13.8	10.6	?	11.9	ND	48.2	ND	ND	ND	0
LK2	6.84	180.9	71.6	71.6	12.6	11.9	?	10.4	0.4	49.2	ND	ND	ND	
LK3	6.66	127.3	65.6	65.6	12.3	8.8	?	9.5	ND	45.1	ND	ND	ND	
LK4	6.58	133.5	172.4	172.4	12.6	8.4	?	9.8	ND	47.1	ND	ND	ND	
LK5	6.97	128.2	67.7	67.7	12.2	9.1	?	9.7	0.2	46.1	ND	ND	ND	
LK6	6.56	86.0	71.6	71.6	12.4	10.7	?	9.9	0.3	48.1	ND	ND	ND	



Map 1: Wells Branch Project (Alt. 2) Timber and Transportation Activities



Map 2: Wells Branch Project (Alt. 2) Prescribed Burn Units



Map 3: Management Prescriptions in the Wells Branch Project Area
(From RLRMP, Jefferson National Forest)

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Glossary

acid neutralizing capacity – ability of a waterbody to resist changes in pH.

advanced regeneration – Seedlings or saplings that develop or are present in the forest understory.

afforestation - the process of restoring and recreating areas of woodlands or forest that once existed but were deforested or otherwise removed or destroyed at some point in the past.

age-class distribution – A distinct aggregation of trees originating from a single natural event or regeneration activity, or a grouping of trees, e.g., a 10-year age class, as used in inventory or management. An age-class distribution is the location and/ or proportionate representation of different age classes in a forest.

analysis area – A collection of land areas, not necessarily contiguous, sufficiently similar in physical, biological, and administrative character that they can be considered a single unit for the purpose of analysis.

antecedent soil moistures – existing level of soil moisture before a rainfall event.

aquatic habitat types – The classification of instream habitat based on location within channel, patterns of water flow, and nature of flow controlling structures. Habitat is classified into a number of types according to location within the channel, patterns of water flow, and nature of flow controlling structure. Riffles are divided into three habitat types: low gradient riffles, rapids, and cascades. Pools are divided into seven types: secondary channel pools, backward pools, trench pools, plunge pools, lateral scour pools, dammed pools, and beaver ponds. Glides, the third habitat type, are intermediate in many characteristics between riffles and pools.

basal area – The cross sectional area of a single stem, including the bark, measured at breast height.

best management practices – A practice, or usually a combination of practices that are determined by a state or a designated planning agency to be the most effective and practicable means of preventing or reducing the amount of pollution generated by non-point source pollutants to a compatible level with water quality goals.

browse – Any woody vegetation consumed, or fit for consumption, by livestock or wild animals.

canopy – The foliar cover in a forest stand consisting of one or several layers.

Continuous Inventory of Stand Condition (CISC) – A database system that, when operational, reflected an up-to-date description of timber stands in the forest. It was used to store, maintain, and retrieve vegetation data.

Code of Federal Regulations (CFR): A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government.

commercial thinning: Any kind of thinning producing merchantable material at least equal to the value of the direct costs of harvesting.

compartment: A portion of a forest under one ownership, usually contiguous and composed of a variety of forest stand types, defined for the purposes of locational reference.

confluence: The point at which two or more streams join to form a larger one.

coppice – A method of regenerating a stand in which all trees from the previous stand are harvested and the majority of regeneration is from stump sprouts or root suckers.

crown – The part of a tree or woody plant bearing live branches and foliage.

crown class – A category of tree based on its crown position relative to those adjacent trees.

- **codominant** – a tree or shrub receiving full light from above, but comparatively little from the sides. Crowns usually form the general level of the canopy. seral level of the main canopy in even or uneven-aged stands, the main canopy of the tree's immediate neighbors, receiving full light from above and comparatively little from the sides.
- **dominant** – a tree whose crown extends above the general level of the main canopy of even or un-even aged stands, above the crowns of the tree's immediate neighbors and receiving full light from above and partial light from the sides.
- **intermediate** – A tree whose crown extends into the lower portion of the main canopy of even or uneven-aged stands, into the lower portion of the canopy formed by the tree's immediate neighbors, but shorter in height than codominants and receiving little direct light from above and none from the sides.
- **overtopped (suppressed)** – a tree whose crown is completely overtopped by the crowns of one or more neighboring trees.

crown closure – The point at which the vertical projections of the crown perimeters within a canopy touch.

crown cover – The ground area covered by the crowns of trees or woody vegetation as delimited by the vertical projection of crown perimeters and commonly expressed as a percent of total ground area.

crown density – The amount and compactness of foliage of the crowns of trees or shrubs.

cubic Feet – A unit of true volume that measures 12 inches long, 12 inches wide, and 12 inches thick.

cultural resources (heritage resources) – The physical remains of human cultural systems and conceptual context of an area, which is useful or important for making land-use planning decisions. The remains include such items as artifacts and ruins, whose contents were significant in an historic, prehistoric, legendary, or sacred context to the culture.

curve numbers – (or runoff curve number) an empirical parameter used in hydrology for predicting direct runoff or infiltration from rainfall excess.

den trees – Trees having rainproof, weather – tight cavities used by wildlife.

desired future condition (DFC) – An expression of resource goals that have been set for a unit of land. It is written as a narrative description of the landscape as it appears when goals have been achieved.

developed recreation – Recreation use or opportunities occurring at developed sites.

diameter at breast height (DBH) – The diameter of the stem of a tree measured at breast height (4.5 feet) from the ground.

dispersed recreation – Recreation outside of developed recreational facilities. Examples are hiking, driving for pleasure, or hunting.

distance zone – One of three categories used in the Scenery Management System (SMS) to divide a view into near and far components. The three categories are:

- Foreground: Part of a scene or landscape nearest to the viewer, usually ¼ - ½ mile from the viewer.
- Middleground: Part of a scene or landscape that extends 1/4 – ½ miles to 3-5 miles from the viewer.
- Background: The distant part of a landscape, located 3 – 5 miles to infinity from the viewer.

diversity – The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

early succession forest – The biotic community that develops immediately following the removal or mortality of most or all of the forest canopy. As used in the RLRMP and EIS, a stand age of 0 to 10 years.

early successional species – Plant or animal species characteristic of early successional forest conditions.

early successional habitat – Vegetative condition typically characterized by low density to no canopy cover and an abundance of herbaceous ground cover. May include forest 0 to 10 years of age, maintained openings, pastures, balds, or open woodlands.

environmental effects – Results achieved or expected to be achieved relative to physical, biological, social, and economic factors resulting from management activities.

- direct effects – Those effects that occur as a direct result of an activity. These effects occur at the same time and place as the activity.
- indirect effects – Those effects that occur as an indirect result of an activity. These effects occur sometime after the activity and/or in a different location.
- cumulative effects – The combined effects of the current activity with other past, present, and reasonably foreseeable future activities. Cumulative effects are incremental in nature.

Endangered Species Act of 1973 – An act that enables conservation of plant and animal species threatened endangered throughout all or a significant portion of its range. It provides a program for the conservation of such species, and takes steps to achieve the purposes of the (relevant) treaties and conventions.

environmental analysis – A concise public document containing a federal agency's analysis of the significance of potential environmental consequences.

erosion – The wearing away of the land surface by running water, wind, ice, or other agents.

even-aged silviculture – A planned sequence of treatments designed to maintain and regenerate a stand with one age class.

existing condition – Representation of a resource condition, level of resource output or effect that exists within a defined area for a specified time period.

exotic species – A plant or species introduced from another country or geographic region outside its natural range.

feathering – A treatment used along the edges of openings in the forest canopy to reduce shadow contrasts by manipulating the density and size of vegetation.

featured species – A species whose habitat requirements will guide planning, timber, and wildlife habitat management coordination and direct habitat improvements to a unit of land. The species represents an association of species with similar habitat requirements.

floodplains – Lowland and relatively flat areas adjacent to water. The minimum area included is subject to a one-percent (100-year occurrence) or greater chance of flooding in any given year. Although floodplains and wetlands fall within the riparian area, they are defined here separately as described in the FS Manual.

forage – All browse and non-woody plants that area available to livestock or game animals used for grazing or harvested for feeding.

ford – The point at which a road or trail crosses a stream without benefit of a bridge or other structure. This is a wet-water crossing.

forest health – The perceived condition of a forest derived from concerns about factors as its age, structure, composition, function, vigor, presence of unusual levels of insects or disease, and resilience to disturbance.

forest development road – A road wholly or partly within, or adjacent to, and serving a part of the National Forest System. It also has been included in the forest Development road System Plan.

forest type – Current forest cover type represented by the commercial tree species existing in a stand.

habitat – The native environment of an animal or plant in which all the essentials for its development, existence, and reproduction are present.

herbicide – A pesticide used for killing or controlling the growth of undesirable plants.

hyporheic – referring to a region beneath and lateral to a stream bed, where there is mixing of shallow groundwater and surface water.

improvement treatment – A cutting method in a stand past the sapling stage primarily to improve composition and quality by removing less desirable trees of any species.

insolation - a measure of solar radiation energy incident on a surface.

interannual variability – natural variations in the background sediment yield of a watershed.

interdisciplinary team (ID Team) – A group of individuals with skills for management of different resources. An interdisciplinary team is assembled because no single scientific discipline is sufficient to adequately identify and resolve issues and problems. Team members ensure integrated use of natural and social sciences as required by the NEPA and NFMA.

interior forest habitat – high canopy forest conditions suitable to meet the requirements of area sensitive species that are adversely impacted by forest edge, including microclimate change (warmer, windier), increased predation, increased brood parasitism, and increased competition.

intermediate treatment – Any treatment designed to enhance growth, quality, vigor, and composition of the stand after establishment of regeneration and before final harvest.

issue – A point of discussion, debate, or dispute about the environmental effects of the proposed action. Not all issues are significant issues. Issues are significant because of the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict.

karst - An area of irregular limestone in which erosion has produced fissures, sinkholes, underground streams, and caverns.

large woody debris (LWD) – Live or dead trees, parts or pieces of trees that are large enough or long enough or sufficiently buried in the stream bank or bed, to be stable enough to provide effective fisheries habitat such as shade or cover.

late successional stage – The stage of forest development at which overstory trees have attained most of expected height growth and have reached ecological maturity. As used in the EIS and RLRMP, a stand age greater than 80 years. Old-growth forests occur during the later periods of this stage at ages that vary by forest community type.

log landing – The site at which harvested logs are gathered before they are loaded onto a truck and hauled away. Conventional landings are those associated with ground-based and cable logging systems and are usually immediately adjacent to or within the harvest unit. Helicopter landings are those landings used during a helicopter logging operation and are generally separate from the actual harvest unit.
management indicator species (MIS) – A particular type of plant or animal whose presence in a certain location or situation is a fairly certain sign or symptom that particular environmental conditions are also present.

management prescription – A Forest Planning term denoting areas of land with similar desired conditions, objectives, and standards for achieving them. Management practices and intensity are selected and scheduled for implementation to attain multiple-use goals and objectives.

mast tree – Generally hardwood trees of the heavy seeded variety including oaks, hickories, walnut, beech: 25 years and older capable of producing frequent seed crops to feed a variety of wildlife species.

mitigation measure (design feature) – Actions to avoid, minimize, reduce, eliminate, or rectify the impact of a management practice.

monitoring – The periodic evaluation on a sample basis of Forest Plan management practices to determine how fully objectives have been met, how closely management standards have been applied, and what effects those practices had on the land and environment.

natural range of variability – In planning, the full range of ecosystem processes and disturbance regimes that occur within the current climatic period.

neotropical migratory birds – A group of bird species that breeds in North America and winters in South America, Mexico or Costa Rica.

no-action alternative – The most likely condition expected to exist in the future if current management direction would continue unchanged.

non-point source pollution – Pollutants detected in a concentrated water source, such as a stream, river or lake, which come from a wide range of sources

open road density – The measure of open road miles per land area. An open road is a motorized travelway used on a regular basis.

preferred alternative – The alternative recommended for implementation by the responsible official.

prescribed burning – Fire burning under conditions specified in an approved plan to dispose of fuels, control unwanted vegetation, stimulate growth of desired vegetation, change successional stages, and maintain fire-dependent communities in order to meet a variety of management objectives.

present net value (PNV) – The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area. Future estimated revenues and costs are 'discounted' to the present by an interest rate that reflects the changing value of a dollar over time. Also called present net worth and net present value.

Priority Watershed - watersheds identified in the Forest Plan as having below average Watershed Condition Ranking1 (WCR), impaired stream segments or outstanding aquatic biodiversity.

reconstruction – Work that includes, but is not limited to, widening of roads, improving alignment, providing additional turnouts, and improving sight distance that improves the standard to which the road was originally constructed. Also undertaken to increase the capacity of the road or to provide greater traffic safety.

regeneration – the re-establishment of forest cover by seeding, planting, and natural means (also called reforestation). Also used as a known referring to the young trees themselves.

regeneration cutting - Any removal of trees intended to assist regeneration already present or to make regeneration possible.
regeneration method – Cutting procedure by which a new age class is created. Major methods are Clearcutting, seed-tree, shelterwood, selection, and coppice.

residual trees – The live trees remaining after a natural or artificial disturbance.

responsible line officer – The Forest Service employee who has the authority to select and/or carry out a specific planning action.

reserve trees – Trees, pole size or larger, retained after the regeneration period under Clearcutting, seed-tree, shelterwood, or coppice methods.

riparian – Land areas directly influenced by water. They usually have visible vegetative or physical characteristics showing this water influence. Streamside, lake borders and marshes are typical riparian areas.

riparian area – Areas with three-dimensional ecotones of interaction that include terrestrial and aquatic ecosystems that extend down into the groundwater, up above the canopy, outward across the floodplain, up the near-slopes that drain to the water, laterally into the terrestrial ecosystem, and along the watercourse at a variable width.

ripping – a process where the soil is mechanically sliced or broken to improve tilth, aeration, and permeability.

road – a motor vehicle path more than 50 inches wide, unless classified and managed as a trail. It may be classed as a system or non-system road.

road closure – a techniques used by management to regulate and control the use of facilities to achieve transpotation economy, user safety, protection of the public investment, and accomplishment of forest resource objectives. It may be intermittent or long term.

road construction – Acitvity that results in the addition of forest system or temporary road miles.

road reconstruction – activity that results in improvement or realighment of an existing system road defined as followes:

- **road improvement –** Activity that results in an increase of an existin road's traffic service level, expansion of its capacity, or a change in its original design function.
- **road realignment –** Activity that results in new location of an existing road or portions of an existing road, and treatment of the old roadway.

road analysis process (RAP) – roads analysis is an integrated ecological, social, and economic science based approach to transportation planning that addresses existing and future road management options. The intended effects are to ensure that decisions to construct, reconstruct, or decommission roads will be better informed by using a roads analysis. Roads analysis may be completed at a variety of different scales, but generally begins with a broad forest-scale analysis to provide a context for future analyses.

sapling – A usually young tree that is larger than a seedling, but smaller than a pole. Size varies by region.

sawtimber – Trees suitable in size and quality for producing logs that can be processed into dimension lumber.

scenic attractiveness – The scenic importance of a landscape based on human perception of the intrinsic beauty of landform, rockform, waterform, and vegetation pattern. Classified as A (Distinctive), B (Common), C (Undistinguished).

scenic class – A system of classification describing the importance or value of a particular landscape or portions of that landscape. Values range from 1 (highest value) to 7 (lowest value).

Scenery Management System (SMS) – A system for the inventory and analysis of the aesthetic values of the National Forest Lands. It replaces the Visual Management System (VMS), as defined in Agricultural Handbook #462.

scenic integrity – A measure of the degree tow which a landscape is visually perceived to be 'complete.' The highest scenic integrity ratings are given to those landscapes, which have little or no deviation from the character valued for its aesthetic appeal. Scenic integrity is used to describe an existing situation, standard for management, or desired future condition.

Scenic Integrity Objective (SIO) – A desired level of excellence based on physical and sociological characteristics of an area. Refers to the degree of acceptable alteration to the valued attributes of the characteristic landscape. Objectives include Very High, High, Moderate, and Low.

> **Very High (VH) –** Generally provides for only ecological changes in natural landscapes and complete intactness of landscape character in cultural landscapes.
>
> **High (H) –** Human activities are not visually evident to the casual observer. Activities may only repeat attributes of form, line, color, and texture found in the existing landscape character.
>
> **Moderate (M) –** Landscapes appear slightly altered. Noticeable human-created deviation must remain visually subordinate to the landscape character being view.
>
> **Low (L) –** Landscapes appear moderately altered. Human-created deviations begin to dominate the valued landscape character being viewed but borrow from valued attributes, such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed.

scoping – The process of notifying the public and other local, state and other federal agencies of proposed Forest Service actions on National Forest lands and requesting public input related to the proposal.

sediment – Solid mineral and organic material that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice

sensitive species - Those species that are placed on a list by the Regional Forester for which population viability is a concern.

silviculture – The art and science of controlling the establishment, growth, composition, health and quality of forests and woodlands. Silviculture entails manipulating forest and woodland vegetation in stands and on landscapes to meet the diverse needs and values of landowners and society on a sustainable basis.

site class – a classification of site quality, usually expressed in terms of ranges of dominant tree height at a given age or potential mean annual increment at culmination.

site preparation – the preparation of the ground surface prior to reforestation. Various treatments are applied as needed to control vegetation that will interfere with the establishment of the new crop of trees or to expose the mineral soil sufficiently for the establishment of the species to be reproduced.

site index – A series-specific measure of actual or potential forest productivity (site quality, usually for even-aged stands), expressed in terms of the average height of trees included in a specified stand component (defined as a certain number of dominants, codominants, or the largest and tallest trees per unit area) at a specified index or base age.

site quality (productivity) – The productive capacity of a site, usually expressed as volume production of a given species.

skid road – A temporary blade-constructed pathway having a road-like function and appearance, used to drag felled trees or logs to a landing. Several skid trails normally branch off of a skid road.

skid trail – A temporary pathway through the woods formed by loggers dragging (skidding) logs from the stump to a log landing or skid road, without dropping a blade and without purposefully changing the geometric configuration of the ground over which they travel.

slash – the residue left on the ground after felling, silvicultural operations, or as a result of storm, fire, girdling, or poisoning. All vegetative debris resulting from the purchaser's operations.

snag – A dead or partially dead (more than 50%) hardwood or conifer tree which is used by many species for perching, feeding, or nesting.

soil compaction – Reduction of soil pore space volume (capacity) that results in alteration of the soil chemical and physical properties.

soil productivity – the inherent capacity of a soil to support the growth of specified plants, plant communities, or a sequence of plant communities. soil productivity may be expressed in terms of volume or weight/unit area/year, percent plant cover, or other measures of biomass accumulation.

stand – A contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure and growing on a site of sufficiently uniform quality to be a distinguishable unit.

stand density – A quantitative, absolute measure of tree occupancy per unit of land area in such terms as numbers of trees, basal area, or volume.

stocking – The degree of occupancy of land by growing stock trees, measured by basal area or number of trees per unit area and spacing compared with a minimum standard: which varies by tree size and species or species group: to the occupancy that is required to fully utilize the growth potential of the land.

suitable land – Land that is managed for timber production.

temporary haul road – A temporary haul road is built to a standard that allows tractor-trailers to drive to and from a landing site for the purpose of hauling logs from a harvest unit. Temporary haul roads are usually excavated and may include surfacing and drainage structures. These roads are not maintained as part of the Forest permanent road system, rather, they are rehabilitated following short-term use by closing access, ripping, seeding, and sometimes planting.

thinning – A cutting made to reduce stand density of trees primarily to improve growth, enhance forest health, or to recover potential mortality.

threatened species – Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and that has been designated in the Federal Register by the Secretary of the Interior as a threatened species.

timber stand improvement (stand improvement) – an intermediate treatment made to improve the composition, structure, condition, health, and growth of even or uneven-aged stands.

two-aged stand – Stand composed of two distinct age-classes separated in age by at least 20% of rotation.

understory – The trees and other vegetation growing under a more or less continuous cover of branches and foliage formed collectively by the upper portion (overstory) of adjacent trees and other woody growth.
uneven-aged regeneration methods – Methods of regenerating a forest stand, and maintaining an uneven-aged structure by removing some trees in all size classes, either singly, in small groups, or strips. The methods are single-tree or group selection.

uneven-aged silvicultural system – A planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes.

unsuitable lands – Forest land that is not managed for timber production because: 1) it has been withdrawn by Congress, Secretary, or Chief; 2) it is not producing or capable of producing crops of wood; 3) technology is not available to prevent irreversible damage to soils, productivity, or watershed conditions; 4) there is no reasonable assurance that lands can be adequately restocked within 5 years after final harvest based on existing technology and knowledge; 5) there is, at present, a lack of adequate information to responses to timber management activities; or 6) timber management is inconsistent with or not cost efficient in meeting the management requirements and multiple use objectives specified in the Forest Plan.

watershed – The total area above a given point on a stream that contributes water to the flow at that point.

yarding – A term used to describe operations used to move logs stump to point where logs are loaded for transport to mill. Methods used in yarding include ground-based, cable based, and aerial based.